

# INDIAN STATISTICAL INSTITUTE

THIRTY-FIFTH ANNUAL REPORT

April 1966—March 1967



203 BARRACKPORE TRUNK ROAD  
CALCUTTA-35

## INDIAN STATISTICAL INSTITUTE

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3. Director, Central Statistical Organisation and ex-officio Joint Secretary, Department of  
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*Co-opted Members* : Dr. D. K. Bose, 2. Professor V. B. Kamath, B.Sc. (Lond.),  
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*Ex-Officio Members* : 1. Dr. (Miss) A. George (Kerala Branch), 2. Professor  
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### 1. INTRODUCTION

1.1. *Genesis*: The idea of starting the Indian Statistical Institute was conceived by Professor P. C. Mahalanobis and a group of young men who had gathered round him in the nineteen twenties (1920-31), being interested in applying statistical methods to the solution of practical problems. There was already a workshop, so to say, for this purpose in what came to be known as the Statistical Laboratory, which was located in the room of Professor Mahalanobis, then professor of physics in the Presidency College, Calcutta. A public meeting was called over the signatures of Pramatha Nath Banerjee (Minto Professor of Economics), Nikhil Ranjan Sen (Khaira Professor of Applied Mathematics) and P. C. Mahalanobis and was held on 17 December 1931, with the late Sir R. N. Mookerjee in the chair. This meeting adopted a resolution which led to the establishment of the Indian Statistical Institute which was registered on 28 April 1932 as a non-profit distributing learned society under the Societies Registration Act XXI of 1860. A part-time computer was the only worker the Institute had in the first year of its existence, the total expenditure being Rs. 238. The Indian Statistical Institute Act of 1959 recognized the Institute as an institution of national importance and empowered it to confer degrees in statistics, thus giving the Institute the status of a university. From 1 July 1960 the Institute, through its Research and Training School, has been conducting courses leading to the degree of Bachelor of Statistics (B. Stat.), and Master of Statistics (M. Stat.), and a doctorate degree (Ph.D.) are also being awarded, with provision for a higher doctorate (D.Sc.) degree. In 1961, the Institute adopted "unity in diversity" as the motto and the banyan tree as a crest, as a result of discussions between the late Sir Ronald A. Fisher, Professor P. C. Mahalanobis and Shri C. D. Deshmukh, the President of the Institute from 1945 to 1964, who translated the English words into the Sanskrit version incorporated in the crest.

1.2. *History of Activities*: Since its inception, the Indian Statistical Institute has been carrying out a well-integrated programme of work of theoretical studies with the focus of interest on practical applications of statistics through project work. These projects raised problems whose solution led to original contributions to statistical theory. The Institute's project work involved close collaboration with the Government, and it used to be done on business-like lines for both private enterprises and the Government, with contract grants for specified purposes. The Institute was built up, in fact, on such "business" earnings. Individual training had started in 1932; the lack of trained statisticians and computers led to the establishment of training courses in 1939, and the award of certificates of competence from 1938. The Institute's educational activities expanded with passing time, and included co-operation with international agencies for training programmes in South East Asia.

In the early days, project work was mainly concerned with two problems. The first was the control of floods, particularly in Bengal and Orissa. The results of this work were

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partly immediate, in the implementation of proper measures for flood control; and partly long-term, coming to fruition in such schemes as the Damodar Valley Corporation and the Hirakud Dam Project. The second set of problems, which centred round agricultural field trials, led to the establishment of contact with Ronald A. Fisher as early as in 1925 and resulted in the introduction in India of his "design of experiments", before these methods were adopted in any other country outside Britain. Theoretical work on the design of experiments was started in the nineteen thirties and received a great impetus with R. A. Fisher's first visit to the Institute in 1938 which led to the Institute workers making important contributions to this subject field. Earlier work on anthropometry and meteorology provided the basis for contributions to statistical theory, especially multivariate analysis with the formulation of the "generalized distance" in the late nineteen twenties. Work on these problems still continue in the Institute.

In 1936, theoretical and field studies were started, at the desire of the Government of India, to develop sample surveys for the improvement of estimates of production of agricultural crops. These studies led to continuing annual crop surveys in Bengal from 1941, and also to important theoretical developments in the design of sample surveys which secured for the Institute a leading position in the world in this subject.

During the Second World War, the Institute became involved in the study of demographic problems. A detailed tabulation of the 1941 population census had to be abandoned owing to the exigencies of war. The Institute had been able to persuade the Government to retain a small sample of the original census slips. On the basis of this sample, the Institute prepared the detailed tables of demographic statistics for the 1941 census. Since that time, research in demography has been an integral part of the Institute's activities.

Research on estimation and distribution theories also started during the war and gradually led to the Institute becoming an internationally known centre for research in mathematical and theoretical statistics.

During the nineteen fifties, the Institute developed important types of project work. The National Sample Survey, initiated by the Government of India, with the help of the Institute, in 1950, is the most comprehensive and continuing socio-econometric survey in the world today. Statistical Quality Control was started in 1953 and gradually developed into a training and consulting service to industry on an India-wide basis, and is fulfilling a basic need in promoting the industrial progress of the country.

The most important development of the Institute's work during the nineteen fifties was its significant contribution to economic planning. The studies on planning were inaugurated at the Institute in Calcutta in 1954 by the late Prime Minister Jawaharlal Nehru, and the Draft Plan Frame for the Second Five Year Plan was prepared on the basis of these studies. The Institute's Planning Unit has since then worked in close collaboration with the Perspective Planning Division of the Planning Commission, and the National Sample Survey data have been found to be of great help in this work.

*Educational Programmes:* All over the world, during the last thirty years or so, statistical methods are being increasingly used in new fields of work. This is clearly seen in the number of books which have been published during this period, surveying the applications of statistics in many separate individual fields of natural science, such as geology, which would once have been thought quite remote from the statistical field.

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The Institute was given powers to award degrees by an Act of Parliament, sponsored by the late Prime Minister Nehru, and passed in 1959. This, together with the recognition of statistics as a key technology, has resulted in a new approach to the teaching of statistics in the Institute, which is also expressed in its research programme.

In universities, the practice for a long time used to be to provide courses in single subjects like mathematics, physics, biology, economics etc. During the latter part of the nineteenth century, it became necessary to develop new educational programmes in two important fields, namely medicine and engineering, because it was essential for the professional students to have some knowledge and skill in a number of scientific disciplines. A similar development occurred in the field of statistics in the Institute.

Sir Ronald Fisher summed up the position of statistics as "the key technology of the present century." In 1962, he pointed out that a technologist must talk the language of both theoreticians and practitioners. The education of a technologist must, therefore, have a broad base. A technologist has to see both sides of the fence, and is the channel through which alone the knowledge and skills of others can be made effective. Fisher said, "It is, I believe, in recognizing statistics as the key technology of our century, that we can appreciate the special features of the Indian Statistical Institute.....What the scientists have to do with statistics lies in the part they must play in the education of any competent statistician."

Statistics, as a new technology, is concerned with the use of the most economic and efficient methods of observation, measurement, survey, and experimentation, and of the processing of data for the drawing of valid inferences. The scope of statistics thus extends over the whole range of both the natural and social sciences.

The courses leading to the B.Stat. or M.Stat. degrees have been formulated to cover a wide range of subjects, somewhat analogous to courses in medicine and engineering. Pure mathematics and the theory of probability are of basic importance. Theoretical and different branches of applied statistics, naturally, form a large part of the teaching programme. Because of the special needs of India, a great deal of attention is given to the economics of planning. In these three groups of subjects, mathematics, statistics and economics of planning, the course includes a good deal of knowledge of basic results and facts, besides theory and methodology.

In addition, facilities are provided for the students to become familiar with the methods of observation, measurement, survey, and experimentation in a number of scientific subjects. Here the emphasis is not so much on the content of knowledge of facts, or of theories, but on methods; and the stress is, therefore, on practical courses and statistical analysis and the interpretation of data.

*The Research Policy:* Ronald Fisher had pointed out "that the science with which the student is to become acquainted must be genuine research in its own right, not what is eloquently called a 'mock-up' for the use of students only." It is, therefore, the policy of the Institute to establish small, high level, research units in both the natural and social sciences, to offer facilities for research and training in the use of statistical methods in practice.

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The Government of India approved this policy in a communication from the Cabinet Secretariat dated 15 June 1962 in the following terms :

"Government accept the view that statistics being a new technology, it should be open to the Indian Statistical Institute to establish and maintain research and study units in subjects other than theoretical and applied statistics to offer facilities for research and application of statistical methods and for the provision of training in such methods. The number of such units would depend on the availability of really able research scientists and also on the funds available to the Institute. Similarly in furtherance of the purposes as set out in Section 5 of the Indian Statistical Institute Act, the Institute may establish and maintain units for the study of different languages (including translation units, library science, documentation, etc.) and for auxiliary studies and teaching in different subjects including humanities."

In this plan, each research unit would be concerned with a particular theme. Where there is more than one professional scientist in the same unit, they may either work jointly on the same topic or on different topics, which would, however, be related to a central problem. Each research paper may be independent, but the results would be capable of being added together to supply a more comprehensive picture of different aspects of the central theme.

This thematic programme of research is particularly useful in underdeveloped countries. In a large department or the faculty of a University, scientists often work on unrelated topics with practically no possibility of communication, or exchange of views and criticisms among them. Scientists in a small research unit working on related groups of subjects can easily communicate with one another; a miniature scientific community can thus be established with the possibility of a free exchange of views and criticisms. Such scientific cells can then gradually build up a scientific community in the country as a whole.

The concept of a thematic programme for each research unit is also useful in preventing the growth of large units with a big staff dealing with a multitude of subjects. The Institute's policy is to have small units of pioneering research arranged in a horizontal or parallel pattern of organization. The Institute's policy is also to encourage joint projects of research and advanced studies by collaboration between two or more research units within the Institute and also with other universities, institutions and organizations.

The Institute's small research units are thus intended to play a quadruple role. Each will contribute to the teaching of degree courses in statistics, familiarizing students with types of problems, and methods of observation, measurement, and experiment, in its own field of natural science. Each unit will actively engage in a programme of pioneering research, which will throw up problems of a statistical nature from time to time, some of which may well stimulate the evolution of new statistical methods. It is also hoped that the research units will be able to act as a liaison between workers in similar fields of science in universities and Government organizations, on the one hand, and the research statisticians of the Institute, on the other, to promote the spread of knowledge of statistical methods in scientific research in India.

Some of these research units have also been functioning in a very encouraging way as the meeting place for active collaboration between the scientists in India and guest scientists from abroad. Such collaboration may be considered as the fourth and an important role of the Institute.



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### 2. GENERAL ADMINISTRATION

2.1. *Membership*: The year 1966-67 started with 60 life members (including five honorary life members), six institutional members and 314 ordinary members on the roll. During the year, 27 ordinary members were enrolled, five ordinary members became life members, three ordinary members resigned and one ordinary and two life members (Sir Dhiran Mitra, Dr. S. K. Banerjee and Dr. Sir Raghunath Purubhattam Paranjpye) died. At the end of the year, therefore, the total membership was 410 consisting of 72 life (including five honorary life members), 332 ordinary and six institutional members.

Seventy-three sessional members and 128 student members were enrolled during 1966-67, compared with 75 sessional and 152 student members in the previous year. Sessional and student members are enrolled for only one year at a time.

2.2. *Annual General Meeting*: The Annual General Meeting was held on 31 October 1966 to transact the business specified in the constitution, namely, election of the President, Vice-Presidents and members of the Council, adoption of the Annual Report for 1965-66 submitted by the Council and the Auditors' Report with Audited Statements of Accounts for 1965-66, together with the Balance Sheets as at 31 March 1966 submitted by Messrs. Lovelock & Lewis, and the appointment of Auditors for 1966-67.

The Annual General Meeting also considered the Auditors' Report, Audited Statements of Accounts and Balance Sheets for the year 1964-65, the examination of which had been postponed in the previous General Meeting for certain additional reports, etc.

The election of office-bearers was due this year. Two of the Vice-Presidents, Shri Viahnu Sahay and Shri P. C. Sen, who were due to retire this year, were re-elected as Vice-Presidents. The names of the President, Vice-Presidents, Chairman, Vice-Chairman and other office bearers and members of the Council as after the election of 31 October 1966 are given in *Annexure 1*. The Auditors' Report, Audited Statements of Accounts for the year 1966-67 and the Balance Sheet as at 31 March 1967 submitted by Messrs. Price Waterhouse Peat & Co. are given in *Annexure 7*.

2.3. *Meetings of the Council*: The Council of the Institute met eight times during the period, on 16 May, 27 July, 29 August, 27 September, 6 October and 31 October 1966 and on 14 January and 23 March 1967.

2.4. *Meetings of the Governing Body of the Research and Training School*: The Governing Body of the Research and Training School met five times during the period on 16 May, 27 September and 31 October 1966 and on 14 January and 23 March 1967.

Important items of business transacted at the meetings of the Council and the Governing Body of the Research and Training School are briefly mentioned in *Annexure 2*.

2.5. *Meetings of the Finance Committees*: The Finance Committee of the Council and the Finance Committee of the Governing Body of the Research and Training School met jointly on 14 May and 26 September 1966 and 21 March 1967 to consider the (a) Auditors' Report, Balance Sheet and Audited Statements of Accounts for 1964-65, (b) the revised budget estimates for 1966-67, (c) report on the recommendations of the Statutory Committee

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for 1965-66, (d) Audit Report and Audited Statements of Accounts for 1965-66, (e) provisional budget for 1967-68, (f) general financial position, (g) final budget estimates for 1966-67, (h) amended budget proposals for 1967-68, (i) auditors' fee for 1966-67, (j) rate of interest for the Provident Fund for 1966-67, and other related matters.

2.6. *Membership of Council, Governing Body and Finance Committees* : The names of the members of the Council, Governing Body of the Research and Training School and of the Finance Committees of these bodies are given in *Annexure 1*.

2.7. *Institute Staff* : Professor P. C. Mahalanobis held the office of Honorary Secretary and Honorary Director of the Institute throughout the period. Dr. C. R. Rao continued as the Director of the Research and Training School.

Shri N. C. Chakravarti continued as a Special Officer on a part-time basis to look after certain constitutional, secretarial, legal and other matters. He also functioned as an Honorary Joint Secretary. Shri S. Basu continued as a Special Officer in charge of the administration of the Delhi sub-office, for liaison with the Central Government and for certain other work. He also functioned as an Honorary Joint Secretary.

Shri Pitambar Pant, Honorary Joint Secretary, remained in charge of the Planning and Regional Survey Unit, Statistical Quality Control and certain other work in New Delhi. Shri P. Ray, an officer in the senior scale of the I.A.S., whose services had been lent to the Institute by the Government of West Bengal, joined as Administrative Officer from June 1966. He was also appointed a Joint Secretary from the same date and later elected as a Joint Secretary from 31 October 1966. Shri B. Roy, Deputy Librarian, who was appointed Assistant Secretary in September 1965 and was empowered to function as an Administrative Officer from 20 January 1966, continued to function as the Assistant Secretary and Administrative Officer throughout the period.

2.8. *New Appointments* : The staff of the Institute was strengthened during the year by the addition of the following persons. The date of joining is shown against each name.

*Research and Training School* : Dr. J. K. Ghosh, M.A. (Stat.), D. Phil (Cal.), 12 October 1966; Dr. G. Ramschandran, M.Sc. (Stat.Mech), Ph.D. (Physics, Madras), 1 January 1967.

2.9. *Resignations and Retirements* : The following members of the senior staff left the Institute on the dates mentioned :

Shri M. S. Bhatnagar, Financial Adviser, 1 August 1966; Shri S. K. Chowdhury, Administrative Officer, 1 June 1966; Dr. R. Dhar, 25 June 1966; Dr. N. S. Iyengar, 13 March 1967; Dr. S. R. S. Varadhan, 1 September 1966.

The following workers retired on 31 March 1966 :

Dr. (Miss) S. Chowdhury; Dr. P. K. Dey; and Dr. R. N. Maitra.

2.10. *Review Committee* : As reported in the Annual Report of 1965-66, the Government of India had set up a Review Committee under sub-section (1) of Section 9 of the Indian Statistical Institute Act (No. 67) of 1959 with Professor Humayun Kabir, M.P., as Chairman. This Committee submitted their report to the Government of India on 22 December 1966.

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The Council of the Institute, in its meeting of 14 January 1967, set up a committee of five members with Dr. C. D. Deshmukh as Chairman for advising the Chairman of the Council of the Institute on matters relating to the report of the Review Committee and/or any communications from the Government of India in that connexion.

[A Government communication (D.O. No. 16/1/67—Estt. III, dated 18 April 1967) forwarding a copy of the report was, however, received by the Institute on 24 April 1967. Subsequent developments in the matter will be mentioned in the Annual Report of 1967-68. The latest position in this respect will, however, be reported separately to the Annual General Meeting to be held in October 1967.]

#### 3. HONOURS AND AWARDS

In recognition of his distinguished work in the field of theoretical and applied statistics, Dr. C. R. Rao, Director, Research and Training School, was elected a Fellow of the Royal Society on 16 March 1967.

Dr. D. Basu (*RFS*) was elected a member of the International Statistical Institute.

Professor T. A. Davis (*Crop Science*) was awarded a cash prize of Rs. 2,000 by the Inventions Promotion Board, Delhi, and the second prize and a silver medal by the All-India Industrial Exhibition Committee, Hyderabad, for his Electronic Insect Detector in January 1967.

#### 4. CONFERENCES AND SCIENTIFIC TOURS ABROAD

Professor P. C. Mahalanobis left New Delhi on 8 October 1966 to attend the meeting of the United Nations Statistical Commission and the International Conference of Labour Statisticians held in Geneva from 10 to 21 October. During his stay in Geneva up to 29 October, he gave a lecture and participated in discussions at the Statistical Laboratory of the University of Geneva. He attended the first Nehru Memorial Lecture by Lord Butler in the Trinity College, Cambridge, and worked for some time on an assignment from the UNESCO. He visited Moscow towards the end of November as a guest of the U.S.S.R. Academy of Sciences, and returned to New Delhi on 3 December 1966.

Professor Mahalanobis left New Delhi on 19 January 1967 for New York via London to attend the meetings of a committee of the United Nations on Social Policy and Distribution of Income held in New York from 23 January to 3 February. He gave lectures and participated in scientific discussions at Madison and Chapel Hill, University of Wisconsin, University of North Carolina, and the George Washington University in Washington D. C. After a short stay in England, he returned on 1 March 1967.

Professor Mahalanobis attended the meetings of a committee of the Organization for Economic Co-operation and Development (O.E.C.D.) on the evaluation of research and development held in Paris from 29 to 31 March 1967 and the Royal Society Conference of Commonwealth Scientists held in the University of Oxford from 7 to 12 April. He returned to New Delhi on 17 April 1967.

Dr. B. C. Das (*Biometry*) participated in the F.A.O. World Symposium on Warm-Water Pond Fish Culture, Rome, from 18 to 25 May 1966. He also presided over two sessions at the Thirtieth International Meeting of the Institute of Management Science, Philadelphia, from 7 to 11 September 1966 and presented a scientific paper.

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Dr. Rhea S. Das (*Appraisal Division*) left Calcutta for Rome, on 15 May 1966, to give a series of lectures at the Twentyfifth Anniversary Celebrations of the Istituto Nazionale di Psicologia, Consiglio Nazionale delle Ricerche, Rome, from 18 to 30 May 1966, and proceeded to the U.S.A. after the lecture series. From June to September 1966, she served as a consultant to the Centre for Comparative Psycholinguistics, University of Illinois, Urbana, Illinois, U.S.A. She presented a paper and presided over one session at the Thirtieth International Meeting of the Institute of Management Sciences, Philadelphia, Pennsylvania, U.S.A., from 6 to 8 September 1966, and returned to India on 18 October 1966.

Professor T. A. Davis (*Crop Science*) participated in the Second International Conference on Palynology at Utrecht, Netherlands, from 28 August to 3 September 1966. After the Conference, he visited eighteen European countries for collecting data and for discussions with scientists, and also delivered twelve lectures at the universities and research centres in these countries. Dr. J. Roy served on the Indian delegation to the seventh session of the ECAFE Conference of Asian Statisticians, held at Bangkok from 13 to 25 June 1966.

Professor S. K. Roy (*Botany*) was on a study-cum-lecture tour in Czechoslovakia, Sweden and Poland from 6 September to 15 November 1966. As a guest of the Slovak Academy of Sciences, he spent most of his time in the Botanical Institute of the Slovak Academy in Bratislava. He visited and participated in discussions in a number of important biological institutes, and gave a lecture in Slovakia. He visited the Institute of Genetics (Lund.), Swedish Seed Association (Svalof) and the Institute of Genetics of the Royal College of Forestry, Stockholm; and gave lectures on "The mechanism of interaction" and "Sociological problems in cultivated plants." As a guest of the Polish Academy of Sciences, he visited some of the important biological institutes in Warsaw, Poznan and Crakow in Poland. He also visited the Institute of Pomology.

### 5. STUDY TOURS AND ASSIGNMENTS ABROAD

Dr. D. Basu (*RTS*) rejoined on 4 July 1966 after spending a year each at the Universities of North Carolina and Chicago.

Dr. N. Bhattacharyya (*Planning Division*) rejoined in August 1966, after a stay of nine months at the Department of Applied Economics, University of Cambridge.

Dr. M. R. Chakravarti (*Anthropology*) was granted 14 months' leave to enable him to work at the Institute of Anthropology and Human Genetics, University of Heidelberg, West Germany, under a von Humboldt Fellowship.

Dr. B. C. Das (*Bionetry*) was in the U.S.A. from June to August 1966 to collect bibliographic and research material for the preparation of a monograph on age-related changes in physico-chemical processes.

Shri A. K. De (*NSS*) joined the Institut National de la Statistique, Paris, in May 1966 under the Indo-French Technical Cooperation Programme to study the methodology used in census and other demographical surveys and rejoined the Institute on 18 January 1967.

Shri Amalendu Ganguly (*NSS*) rejoined the Institute on 11 August 1966, on the termination of his assignment with the Organisation for Economic Cooperation and Development as a consultant to the State Institute of Statistics, Ankara, Turkey.

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Dr. S. K. Gupta (*Chemistry*) attended the First International Training Programme in Social Science held in Holland from January to July 1966.

Dr. S. L. Jain (*Geology*) was granted six months' special leave to enable him to study museum work at the Carnegie Museum, Pittsburgh, Pennsylvania, U.S.A., and for consultations on his own research problems with American paleontologists.

Shri Priyotosh Maitreya (*NSS*) rejoined the Institute on 12 September 1966, on the termination of a two-year assignment as a research fellow (Rockefeller Grant) at the Makerere University and the East African Institute of Social Research, Kanyoosa, Uganda.

Shri Rabin Mukherjee (*Planning Division*) was awarded a Fellowship and a Tuition Waiver Award by the University of Rochester, U.S.A., to work for a Ph.D. in economics.

Dr. P. K. Pathak (*RTS*) accepted a one-year assignment in the University of Illinois and left the Institute, on leave, in September 1966.

Shri K. G. Ramamurthy (*Statistical Quality Control*) left for the United Kingdom on 30 May 1966 on a one-year United Nations fellowship programme. After the completion of assignments with the operations research groups of the British Iron and Steel Research Association and Messrs Urwick, Orr and Partners, he has been working under Professor Cox at the Imperial College, London.

Dr. G. Rangarajan (*Planning and Regional Survey Unit, Delhi*) was granted leave for one year in August 1966 to work as a Visiting Associate Professor at the New York University, U.S.A.

Dr. J. Roy (*Computer Science*) accepted a one-year assignment in the Pennsylvania State University and left the Institute, on leave, in August 1966.

Dr. B. Roy Chaudhuri (*Geology*) left the Institute in August 1966, to accept an appointment in the Geological Survey of Canada, with permission to resume his duties in the Institute on the expiry of that appointment.

Shri B. K. Sarkar (*Statistical Quality Control*) left India on 3 December 1966 on deputation by the Institute for one year on a United Nations fellowship programme to the U.S.A. in the field of industrial engineering, and he has also been attending courses at the Georgia Institute of Technology.

Dr. T. N. Srinivasan (*Planning and Regional Survey Unit, Delhi*) was granted leave for one year in December 1966 to work as a visiting professor at the Stanford University, U.S.A.

### 6. RESEARCH AND TRAINING SCHOOL

During the period under review, the Research and Training School (RTS) carried out its research work under the guidance of the Director, C. R. Rao. The units for applied research and science laboratories attached to the Research and Training School, together with the names of the heads of units, are as follows :—Biswanath Prasad Adhikari (*Anthropology and Computer Science*), Prubhat Ranjan Pal (*Biochemistry*), Bhupendra Chandra Das (*Biometry*), Subodh Kumar Roy (*Botany*), Trupapur Antony Davis (*Crop Science*), Shyamal Kumar Gupta (*Chemistry*), Manapadom Venkateswarier Raman (*Demography*), Ratan Lal Brahmachary (*Embryology*), Nalini Kanta Bose (*Flood Research*), Sibabrata Chatterjee

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(*Psychometric Research and Services*) and Ramkriahna Mukharjee (*Sociology*). Bimalendu Roychoudhuri, Head, Geological Studies Unit, having accepted an appointment in Canada, the charge of that Unit was held by the Director C. R. Rao during the year.

Asokre Moitra was in charge of training at the International Statistical Education Centre, Calcutta. Sujit Kumar Mitra was in charge of the Summer School. Subodh Kumar Roy was the Dean of Studies.

The following research and training courses were conducted by the Research and Training School in 1986-87 :

1. *Research Courses*
  - 1.1 Research and advanced studies, general.
  - 1.2 Research leading to the Ph.D. degree of the Institute.
2. *Degree Courses*
  - 2.1 Four-year course leading to the B.Stat. degree of the Institute.
  - 2.2 Two-year course leading to the M.Stat. degree of the Institute.
3. *Specialized Courses in Applied Statistics leading to Diplomas*
  - 3.1 Econometrics and Planning
  - 3.2 Demography
  - 3.3 Large Scale Sample Surveys
  - 3.4 Statistical Quality Control
  - 3.5 Other subjects
4. *Summer Courses in Statistics*
5. *Training Courses in Statistics*
  - 5.1 Statistical Officer's Training Course (jointly with Central Statistical Organisation, 6/9 months).
  - 5.2 Special Short-duration individual training for officers on deputation.
6. *Evening Courses*
  - 6.1 Statistical Methods and Applications, at Delhi (in collaboration with the CSO).
  - 6.2 Statistical Methods and Applications, at Hyderabad (in collaboration with the Indian Institute of Economics).
  - 6.3 Statistical Methods and Applications, at Trivandrum (in collaboration with the University of Kerala).
  - 6.4 Statistical Methods and Applications, at Bombay and Madras (by the branch offices) and Calcutta.
  - 6.5 Elementary Techniques of Computation, Calcutta.
7. *Electronic Computer Courses*
  - 7.1 Nine-month Course in Automatic Data Processing Systems.
  - 7.2 Three-month Intensive Course on Programming and Applications.
  - 7.3 One-year Diploma Course in Computer Science.

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8. *Courses at the International Statistical Education Centre, Calcutta. (10 months)*  
(in collaboration with the International Statistical Institute under a Board of Directors with the representatives of the International Statistical Institute, Indian Statistical Institute and the Government of India).
9. *One-year Training Courses in Documentation at Bangalors*
10. *One-year Diploma Course in Statistical Quality Control*

#### 6.1. ADMISSIONS TO DEGREE AND TRAINING COURSES

Selection tests for admissions to the B.Stat., M.Stat. degrees and post-M.A./M.Sc. research courses leading to registration for the Ph.D. degree, as well as other diploma and certificate courses of the Institute were held in July 1966 at eight centres : Banaras, Bombay, Calcutta, Delhi, Hyderabad, Madras, Trivandrum and Waltair. The selection of candidates to the courses was made by committees consisting of the representatives of the Indian Statistical Institute (ISI), the Institute of Agricultural Research Statistics (IARS) and the Central Statistical Organisation (CSO).

A table showing the number of students in the various courses is given in *Annexure 3*.

#### 6.2. SUMMER SCHOOL

The Advanced Summer School which was started six years ago for the benefit of University teachers and research workers who wanted to utilize their summer vacation for advanced studies and research was conducted during May/June 1966 in collaboration with the Tata Institute of Fundamental Research, Bombay. Two distinguished scientists, Professor R. C. Bose, University of North Carolina, U.S.A., and Professor C. Berga, Director, International Computation Centre, Rome, were invited to give lectures on Coding Theory and Graph Theory. The course was attended by 41 participants.

#### 6.3. INTERNATIONAL STATISTICAL EDUCATION CENTER (ISEC)

Twenty-six students from thirteen countries in the Middle, South and the Far East and also from Africa attended the regular and special courses during the Twentieth Term of the International Statistical Education Centre, Calcutta. The ISEC is operated jointly by the International Statistical Institute and the Indian Statistical Institute, under the auspices of the UNESCO and the Government of India. The Twentieth Term functioned under a Board of Directors with Professor P. C. Mahalanobis as Chairman.

The Government of India awarded a total of 20 fellowships and scholarships for the foreign trainees in the Twentieth Term, under the Technical Co-operation Scheme of the Colombo Plan (16), Special Commonwealth African Assistance Plan (3), and Ministry of Education General Cultural Scholarship Scheme (1).

The Twentieth Term opened on 15 July 1966. The training imparted included lectures, laboratory work, project training, assisted reading and field work. The first three months at Calcutta were devoted to general statistical methods including auxiliary mathematics, computational techniques, economics, economic statistics and statistical organization and procedures. As in the previous terms, training in governmental statistics was given

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at the Central Statistical Organisation, New Delhi. General lectures on a more advanced level were given at Calcutta on sample survey techniques with special reference to the National Sample Survey, Statistical Quality Control, Demography and Vital Statistics, Advanced Statistical Methods and Analysis of Variance, Elements of the Theory of Design of Experiments and Economic Planning. Training in subjects of specialization was imparted to the trainees during the last three months. They also received practical training in crop-cutting experiments.

All the 21 trainees of the regular course were recommended for Certificates of Merit in the final examinations.

### 6.4. FIFTH CONVOCATION

The Institute held its Fifth Convocation for awarding the B.Stat., M.Stat. and Ph.D. degrees on 17 March 1967. Certificates were also distributed at this function to the trainees of the International Statistical Education Centre and diplomas to the successful candidates in the Statistician's Diploma and Diploma in Statistical Quality Control. Shri C. D. Deshmukh presided and Professor P. C. Mahalanobis, F.R.S., delivered the convocation address. Shri S. Dutt, Vice-Chairman of the Institute, welcomed the guests. Dr. C. R. Rao, F.R.S., Director, Research and Training School, presented the annual review of research and training. Dr. B. P. Adhikari proposed the vote of thanks.

Six candidates were awarded the Ph.D. degree, twenty-seven the M.Stat. degree by examination, three the M.Stat. degree by thesis and eighteen the B.Stat. degree. Twelve candidates were awarded the Statistician's Diploma and twelve, the Diploma in Statistical Quality Control. Certificates of merit were awarded to twenty-one students of the International Statistical Education Centre.

A list of candidates who were awarded degrees, diplomas and certificates is given in *Annexure 4*.

### 7. VISITING SCIENTISTS

A number of distinguished foreign scientists participated in the research, training and other activities of the Institute during the year. Some of them stayed at the Institute for fairly long periods and assisted in the regular work of the Institute, while others came for short periods and gave lectures and participated in seminars. Most of them were available for consultations by research workers and teachers of the Institute. A number of these scientists also held consultations with Government departments.

I. The following scientists worked at the Institute for fairly long periods during the year.

1. Professor R. C. Bose, Department of Statistics, University of North Carolina, U.S.A. (10 May—8 July 1966). He was invited to deliver lectures at the Sixth Summer School on Combinatorial Problems organized jointly by the Tata Institute of Fundamental Research, Bombay, and the Indian Statistical Institute, Calcutta. He gave lectures on Classification of Quadrics in Finite Spaces, Coding Theory and Hermitian varieties and also participated in seminars and discussions with the staff members of the Research and Training School.

2. Dr. D. N. Durmanov, Reader, Department of Plant-growing, People's Friendship University, Moscow, U.S.S.R., came to the Institute under the Indo-Soviet Cultural



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Exchange Programme (15 November 1966—15 February 1967). He collected data on the problems of horticulture in general and with special reference to citrus plants. For this purpose, he visited Assam, Darjeeling and the departments of agriculture and agricultural colleges in different parts of India such as Banars, Madras, Bombay, Poona and Delhi.

3. Dr. M. Engert, Chief, Department for International Co-ordination of Plans, Institute for National Economy, Berlin, German Democratic Republic (18 January—14 February 1967). He came to India under the Indo-G.D.R. Cultural Exchange Programme and participated in seminars and held discussions with staff members. He gave a lecture on "Long-term and short-term planning in the German Democratic Republic."

4. Dr. Gotthard Forbrig, Member, Board of Scientists, State Central Administration of Statistics, German Democratic Republic; Director, Institute of Statistics, Engineering—Economic Faculty, University of Rostock, came to India under the Indo-G.D.R. Cultural Exchange Programme (16 January—14 February 1967). He participated in seminars and held discussions with staff members. He also visited some Government statistical offices at Calcutta and Delhi. He gave lectures on "Measurement of labour productivity in the industries of the German Democratic Republic."

5. Dr. David V. Glass, Martin White Professor of Sociology, University of London, U.K., (30 January—16 April 1967). He visited the Institute under the Colombo Plan and initiated certain projects in socio-economics, demography and family planning. He worked for some time at the Planning and Regional Survey Unit (Delhi), and held useful discussions on population growth and urban planning problems.

6. Mrs. Ruth Glass, Director, Research Centre for Urban Studies, University College, London, U.K., visited the Institute (30 January—16 April 1967) under the Colombo Plan. She worked at the Planning and Regional Survey Unit (Delhi) on problems of urban planning and regional development in India and held a seminar on "Problems of research on spatial aspects of economic development."

7. Dr. Z. Govindarajulu, Associate Professor of Mathematics, Case Institute of Technology, Cleveland, U.S.A. (27 July—12 August 1966). He spent most of his time at the Institute in research, in particular, on non-parametric statistical inference. He also gave a lecture on "Asymptotic theory in the non-parametric case."

8. Professor Leonid Hurwicz, Professor of Economics and Statistics, University of Minnesota, U.S.A., worked in the Institute for about five weeks at different times during April and July 1966. In collaboration with the Planning and Regional Survey Unit (Delhi), he initiated a pilot study on information flows relevant to decision making with regard to the allocation of scarce resources in development programmes.

9. Dr. T. Kailath, Stanford Electronic Laboratories, Stanford, U.S.A. (18 July—18 August 1966). He gave a course of lectures on the application of statistical techniques in signal detection and estimation.

10. Dr. Werner Karbstein, Head, Section for Balancing of Gross Products, State Central Administration of Statistics, German Democratic Republic, came to India under the Indo-German Cultural Exchange Programme (16 January—14 February 1967). He participated in seminars and held discussions with staff members. He also visited some Government statistical offices.

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11. Dr. (Mrs.) Larisa A. Knyazhinakyn, Institute of Geography, U.S.S.R. Academy of Sciences, Moscow (13 September 1966—14 March 1967) came as an expert under the Indo-Soviet Cultural Exchange Programme. She visited a number of Indian Universities and research institutions and made some preliminary studies on the problems of population and land resources of India. She spent some time with the Planning and Regional Survey Unit (Delhi) to discuss the problems of regional cropping patterns.

12. Dr. (Mrs.) G. M. Krasnovayeva, Assistant Reader, Department of Internal Diseases, People's Friendship University, Moscow, U.S.S.R., came to the Institute under the Indo-Soviet Cultural Exchange Programme (15 November 1966—18 January 1967). She visited the School of Tropical Medicine, S.S.K.M. Hospital and the Department of Post-Banaras, Graduate Studies, Calcutta Medical College and a number of other hospitals in Calcutta, Delhi and the Colliery Hospital near Giridih and several other medical colleges. She collected data on medical education in Indian universities from all these places.

13. Dr. Alfred Lachnit, Head, Department of Foreign Trade and Communications, State Central Administration of Statistics, German Democratic Republic, came to India under the Indo-German Cultural Exchange Programme (10 January—14 February 1967). He participated in seminars and held discussions with staff members. He also visited some statistical offices in Calcutta and Delhi. He gave a lecture on "Income statistics in the German Democratic Republic."

14. Dr. (Mrs.) P. Naidenova, Scientific Collaborator, Economic Institute, Bulgarian Academy of Sciences, came to the Institute under the Indo-Bulgarian Cultural Exchange Programme (6 December 1966—7 June 1967). She delivered lectures on the following subjects: (i) Problems of input-output balances in the People's Republic of Bulgaria, (ii) Pattern of industry and inter-industry relations in the People's Republic of Bulgaria, (iii) New form of Latin Square design, (iv) Statistical estimation of results of fields experiments by new functions, and (v) Family budget surveys of Bulgaria. She studied the techniques of large-scale sample surveys developed at the Institute and other centres in India.

15. Professor T. V. Narayana, Department of Statistics, University of Alberta, Canada (8 September—15 November 1966). He was on sabbatical leave and spent most of his time at the Institute in research on probability and statistics. He also gave a course of two lectures on "Some combinatorial problems and their applications to probability theory and statistics."

16-18. Dr. David Owens, Mr. Stephen Morris and Mr. Paul Mathews of the Unit for Economic and Statistical Studies on Higher Education, London School of Economics, worked in the Planning and Regional Survey Unit (Delhi) for varying periods during 1966-67. They were engaged in forecasting manpower and educational requirements in India.

19. Dr. V. G. Rastyannikov, Institute of Peoples of Asia, U.S.S.R. Academy of Sciences, Moscow (1 November 1966—18 January 1967). As an expert under the Indo-Soviet Cultural Exchange Programme, he visited Calcutta, Bombay, Delhi, Jabbalpur, Poona, Madras, Trivandrum, Waltair, and Nagpur and made some preliminary studies on the problems of capital formation and factors influencing the rate of growth of Indian agriculture. He gave a lecture in Calcutta on "Problems of capital accumulation in India with special reference to the rural economy," and one in Bombay on "Capital formation in the agricultural sector in India."

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20. Dr. P. L. Robinson, University College, London, (26 November—20 December 1966) She paid a short visit to help the Geological Studies Unit in arranging the field programme for the current year and in planning future research work.

21. Dr. Samuel S. Shapiro, Consultant in Statistical Quality Control, Research and Development Department, General Electric Co., U.S.A. an United Nations expert in Statistical Quality Control and Industrial Engineering, was assigned to the Statistical Quality Control Division of the Indian Statistical Institute (17 April 1966—2 March 1967). He worked in collaboration with the staff of the S.Q.C. units and was closely associated with their promotional programmes. Utilising his specialised knowledge and experience, special training courses were conducted in the valuable techniques of reliability engineering. Besides on-the-job training of the junior staff during their work in plants and in projects, he was specially engaged in organizing a system for quality functions in both the private and public sector plants.

22. Dr. A. M. Sinyukhin, Reader, Department of Agricultural Chemistry, People's Friendship University, Moscow, U.S.S.R. came to the Institute under the Indo-Soviet Cultural Exchange Programme (15 November 1966—15 February 1967). He spent most of his time in the study of new methods of bio-physics, bio-chemistry and plant physiology in some Indian universities and institutions in Calcutta, Bombay, Madras and Delhi. He also collected data on potassium nutrition of tropical plants from the agricultural departments of Indian States.

23. Dr. R. L. M. Syngé, F.R.S., Nobel Laureate, Rowett Research Institute, Aberdeen, U.K. (17 July—2 September 1966). This was Dr. Syngé's second visit to the Institute, the first being in 1965. He initiated some projects to investigate, from a chemical point of view, the nature of the observed favourable in experiments conducted by the Institute on mixed cropping.

24. Dr. Daniel Thorne, Ecole Pratique des Hautes Etudes, Paris, (31 July—12 September 1966). He toured India in connexion with his studies of the food problem in the context of agrarian reforms and agricultural development. He participated in the teaching work in Delhi and held seminars and discussions with the staff members.

25. Professor Yasutoshi Washio, Koio University, Japan (29 December 1966—20 May 1967) came as a visiting lecturer in Statistical Quality Control at the International Statistical Education Centre, Calcutta.

26. Dr. Thomas E. Weisskopf, Harvard University, U.S.A.; who is now working in the Planning and Regional Survey Unit (Delhi) as a visiting professor, arrived in India on 24 September 1966. He has been teaching economics to the students of M.Stat. and also conducting research on planning models and input-output analysis, with special reference to import substitution. He held a seminar on "A programming model for import substitution in India."

II. The following is a list of scientists and scholars who paid brief visits :

1. Dr. R. R. Bahadur, Department of Statistics, University of Chicago, U.S.A. (3 September 1966). *Lecture* : A remark on Quantiles.

2. Dr. Sheela Bildikar, McGill University, U.S.A. (8-0 November 1966). *Lectures* : (i) Identifiability of countable mixture, and (ii) Exponential type distributions.

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3. Academician M. Kh. Chailakhyn, Timiryazev Institute of Plant Physiology, U.S.S.R. Academy of Sciences, Moscow (30 January 1967).

4. Mr. R. Chandrasekhar, University of California, Berkeley, U.S.A. (10-14 November 1966). *Lectures*: (i) Quadratic programming, and (ii) Forest fire control.

5. Professor A. B. Cherna, Professor, Social Sciences, Loughborough University of Technology, U.K. Consultant to the Council, Social Science Research Council (27 January 1967). His visit was primarily for the purpose of studying the organization and utilization of social sciences in India.

6. Professor M. L. Dhawan, Professor of Mathematics (Retired), Government College, Lahore, Pakistan (22 February 1967). *Lecture*: High speed methods in computation.

7. Dr. F. E. Fiedler, Professor of Psychology; Director, Group Effectiveness Laboratory, Department of Psychology, University of Illinois, U.S.A. (13-16 November 1966). *Lecture*: Leadership and communication on culturally heterogeneous groups.

8. Professor Charles Fisher, Centre for Oriental Studies, University of London, U.K., visited the Planning and Regional Survey Unit (Delhi) for discussions on regional studies in India (24 February 1967).

9. Dr. Alexander Vladimir Gusev, Senior Scientific Officer, Institute of Zoology, U.S.S.R. Academy of Sciences (7 January 1967). He had discussions with the workers of the science research units of the Research and Training School.

10. Dr. L. Hamilton, Biology Department, Middlesex Hospital Medical School, London, U.K. (27 March—3 April 1967). *Lecture*: A new look at Somite segregation in Amphibian embryos.

11. Mr. K. Hayashi, Representative in India of the Institute of Asian Economic Affairs, Tokyo, Japan. (9 February 1967). He visited the Documentation Research and Training Centre, Bangalore, of the Indian Statistical Institute, for discussions with the senior staff on the Syntax of Facets and Absolute Syntax.

12. Dr. Howard C. Hopps, Chief, Geographic Pathology Division, Armed Forces Institute of Pathology, Washington, D. C., U.S.A. (1 November 1966). He had discussions in the Biometric Research Unit regarding current research work.

13. Dr. L. A. Jakobvits, Assistant Professor and Co-Director, Centre for Comparative Psycholinguistics, Institute of Communications Research, University of Illinois, U.S.A. (2-7 April 1966) *Lecture*: Semantic Satiation.

14. Professor C. G. Khatri, University School of Sciences, Gujarat University, Ahmedabad (1-5 March 1967) *Lectures*: (i) Some results for the singular multivariate regression models, and (ii) Testing the equality of parameters in the distributions when the range depends upon the parameter.

15. Mr. Akio Kato, Library Services Division, Institute of Asian Affairs, Tokyo, Japan (9 February 1967). He visited the Documentation Research and Training Centre, Bangalore, of the Indian Statistical Institute, for discussions with the senior staff on the Syntax of Facets and Absolute Syntax.

16. Professor T. Kitagawa, Professor of Mathematical Statistics, Faculty of Sciences, Kyushu University, Japan (2-7 May 1966) *Lectures*: (i) Automatically controlled statistical procedures, and (ii) Mathematical programming symposium of the Japanese Union of Scientists and Engineers.

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17. Professor J. Kuczyński, Economic Historian, Academy of Sciences, German Democratic Republic (5-8 May 1966) *Lecture* : Economic problems of the technical revolution.
18. Shri A. C. Mukhopadhyay, All India Institute of Hygiene and Public Health, Calcutta (29 August 1966). *Lecture* : Some problems in medical statistics.
19. Professor S. Ninomiya, Aoyama Gakuin University, Tokyo, Japan (23-28 October 1966). *Lecture* : Some results for the queuing system M/M/S (N+3).
20. Professor H. R. Pagels, University of North Carolina, U.S.A. (20 July 1966). *Lecture* : Recent research in elementary particle physics.
21. Mr. G. A. Redhouse, International Computers and Tabulators, London, (30 January 1967). His visit was in connexion with collaboration schemes for the manufacture in India of software for electronic computers.
22. Shri V. K. Rohatgi, The University, Sheffield, U.K. (13-16 April 1966) *Lectures* : (i) Convergence rates in law of larger numbers, and (ii) Some difference equation in probability and statistics.
23. Dr. V. B. Singh, Department of Economics, Lucknow University (29-31 December 1966). *Lectures* : (i) The concepts of productive and unproductive labour and their relevance to economic development, and (ii) The structure of investment in Indian Plans.
24. Professor E. C. G. Sudarshan, Syracuse University, New York, U.S.A. (14 June 1966). *Lecture* : Present state of elementary particles.
25. Dr. E. J. Williams, Professor of Statistics, University of Melbourne, Australia (27 February—4 March 1967). *Lectures* : (i) Some relations among stable distribution, (ii) Problem in the comparison of predictors, and (iii) Analysis of multivariate associations.

### 8. PROFESSIONAL EXAMINATIONS

*Holding of Professional Examinations* : For the May 1966 session, the Statistician's Diploma (SD), the Computer's Certificate (CC), the Punched Card Data Processing Diploma (PCDDP) and the Punched Card Machine Operator's Certificate (PCMOC) examinations were held from 18 to 28 May. During the November 1966 session, however, all the four professional examinations mentioned earlier and the Statistical Field Survey examinations (Junior and Senior Certificates and Diploma) were held from 18 to 30 November.

The examinations were held at the following centres : Bangalore, Bombay, Calcutta, Delhi, Giridih, Lucknow, Madras and Poona. Two additional centres were opened at Bangalore and Poona as a temporary measure in November 1966.

*Statistician's Diploma Examination* : During 1966, 209 candidates registered (92 in May ; 117 in November), compared with 209 (106 in May ; 104 in November) in 1965. Thirty candidates were absent throughout in 1966 (7 in May ; 23 in November), compared with 30 in 1965 (15 in May ; 15 in November). Of those who finally appeared, 107 candidates (60 in May ; 67 in November) passed in 1966 in one or more papers, compared with 78 (40 in May ; 38 in November) who passed in one or two papers in 1965.

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*Computer's Certificate Examination* : During 1966, 28 candidates registered (14 in May ; 14 in November), compared with 87 (34 in May ; 23 in November) in 1965. Six candidates failed to appear in any of the papers in 1966 (4 in May ; 2 in November). There were no absentees in 1965. Of the candidates who finally appeared, 11 passed in one or more papers in 1966 (5 in May ; 6 in November), compared with 27 who passed in one or more papers in 1965 (14 in May ; 13 in November).

*Punched Card Data Processing Diploma Examination* : Only one candidate appeared in May but he failed. In November 1966, 3 candidates registered and appeared for this examination, of whom 2 passed in one or more papers.

*Punched Card Machine Operator's Certificate Examination* : Only one candidate registered and appeared in May 1966 and passed in one paper only. In November 1966, 2 candidates registered and appeared. Of these, only one passed in two papers.

*Statistical Field Survey Certificate (Junior and Senior) and Diploma Examinations* : The examinations in 1966 were held as usual only in November. One candidate registered for the Junior Certificate, 5 for the Senior Certificate and 6 for the Diploma examinations. All the registered candidates appeared for the Senior Certificate and Diploma Examinations. The only candidate for the Junior Certificate examination did not appear. Of the candidates for the Senior Certificate, only 2 passed in one paper, while 3 candidates passed in one or more papers of the Diploma examination.

The corresponding figures of candidates registered for the examinations held in November 1965 were one for the Junior Certificate, 3 for the Senior Certificate and one for the Diploma examination. All of them had appeared and one had passed the Junior Certificate, one the Senior Certificate and one in the Diploma examinations.

The total number of candidates who qualified for the award of Diploma and Certificate during 1966, having completed the entire examination during the year were 11, (5 in May ; 6 in November) for the Statistician's Diploma, one for the Computer's Certificate in May and one for the Statistical Field Survey Diploma in November. No candidate was able to qualify for the Statistical Field Survey (Junior and Senior) Certificates.

*Award of Diplomas* : Thirteen diplomas for the professional statistical examinations (12 Statistician's Diploma and one Diploma for the Statistical Field Survey) were awarded at the Fifth Convocation of the Indian Statistical Institute held on 17 March 1967.

### 9. PLANNING DIVISION

9.1. *Planning and Regional Survey Unit (PRSU), New Delhi* : The PRSU continued to carry on research work on economic planning and regional survey under the guidance of Shri Pitambar Pant, Honorary Joint Secretary, Indian Statistical Institute and Adviser, Perspective Planning Division, Planning Commission. The PRSU collaborated closely with the Perspective Planning Division in its research activities and a number of studies were carried out jointly. Several foreign experts on planning visited the unit during the year. Some of the experts whose visits were of a long duration engaged themselves in joint studies, while others conducted seminars or had informal discussions.

The Research and Administration Committee supervised the day-to-day research and administration work of the unit. As in previous years, the work continued to be done

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in the *Fojana Bkacen* and this arrangement enabled the workers to maintain close contact with the workers of the Planning Commission.

Seven papers by staff members were published and nine sent for publication (*Annexure 5*). Eight working papers and technical notes were also prepared.

Three seminars were organized in the PRSU during the year. Among the foreign visiting professors who took part, mention may be made of Dr. T. E. Weiskopf, Harvard University, U.S.A. and Mrs. Ruth Glase, Director, Research Centre for Urban Studies, University College, London.

9.2. *Planning Division, Calcutta* : The main fields of research covered in Calcutta were national income and allied topics, consumer behaviour, macro-economic programming, econometrics and miscellaneous other subjects. Twenty-six seminars and lectures were organized in the Planning Division during the year. Among the foreign experts who took part in seminars and lectures, particular mention may be made of Dr. V. G. Rashtyannikov, Institute of Peoples of Asia, U.S.S.R. Academy of Sciences; Professor J. Kuczynski, Economic Historian, Academy of Sciences, German Democratic Republic (G.D.R.); Dr. M. Eogert, Chief, Department for International Co-ordination of Plans, Institute for National Economy, Berlin, G.D.R.; Professor G. Forbrig, Director, Institute of Statistics, Engineering—Economic Faculty, University of Rostock, G.D.R.; Dr. A. Lechnit, Head, Department of Foreign Trade and Communication, State Central Administration of Statistics, G.D.R.; and Dr. (Mrs.) Penka Naidenova, Scientific Collaborator, Economic Institute, Bulgarian Academy of Sciences. Courses of lectures on econometrics and other selected topics were given by the members of the staff and others.

As in previous years, the Planning Division shared with the Delhi Planning Unit the responsibility of teaching economics and econometrics in the Research and Training School (RTS) and the International Statistical Education Centre (ISEC). The courses were organized in collaboration with National Sample Survey and other departments and covered the B.Stat. and M.Stat. degree courses, Statistical Officers' Training Courses, Statistical Courses of the ISEC and One-Year Evening Course for Statisticians. A new course leading to a diploma in planning and econometrics was started during the year. Apart from organizing lectures and practical classes for the above courses, the Division also arranged intensive specialization courses in planning and econometrics for three ISEC students. Research supervision continued to be an activity of the Division. One candidate was awarded the Ph.D. degree of the Institute during the year, on the basis of his work done earlier in the Division. Two foreign students, Mr. Manfred Fildsieper, West Germany, and Mr. Jiri Ferek, Czechoslovakia, conducted research in the Division during the year. Besides four papers published and seven papers submitted for publication (*Annexure 5*), 20 working papers and technical notes were also prepared by the workers.

A new series entitled, *Studies in Quantitative Economics*, was started recently for publication in mimeographed form selected working papers prepared in the Division, with the intention of having a wider circulation of papers for research workers and institutions. Six additions were made to this series during the year.

*Publications* : The printing of the volumes, *Studies on Consumer Behaviour*, Vol. II, by P. C. Mahalanobis and others, and the *Structure of the Indian Economy* by A. K. Chakravarti and his associates are nearing completion. The *Papers on Econometrics and Allied Topics*, A selection of papers presented at the Indian Econometric Conference, is in the press.

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### 10. NATIONAL SAMPLE SURVEY PROJECT

The National Sample Survey Division of the Institute functions as the technical wing of the Government of India's National Sample Survey Organization. The twenty-first round of the regular socio-economic survey and the Annual Survey of Industries for 1964 and 1965 were in operation during the year. About ten different country-wide enquiries were conducted in the socio-economic surveys. A special integrated schedule, covering all important economic aspects of a household, was also included in this year's programme.

The activities of the Division covered the following types of work during the year.

- (a) the statistical planning of surveys, including sample designs, concepts and definitions, methods of collecting primary information, preparation of schedules of enquiries, training of field workers and technical work relating to field enquiries ;
- (b) programme of statistical processing and laying down of detailed specifications ;
- (c) conducting the field work in the State of West Bengal and the city of Bombay, together with experimental researches for the improvement of sample designs and techniques; and
- (d) the processing of the NSS data.

The processing and tabulation work covered data collected during the fifteenth to twentieth rounds of the socio-economic surveys, the Annual Survey of Industries from 1960 to 1965 and the Family Living Surveys (middle class and working class).

(e) schedules and instructions for a special joint study on the errors of aggregation of crop areas in the non-NSS series in the Andhra Pradesh were prepared and NSS workers of the Indian Statistical Institute participated in the field work.

The tabulation and processing work was carried out in Calcutta (Baranagar), Delhi and Giridih. The number of schedules scrutinized was about five lakhs, the number of cards punched about 44.5 lakhs and there were about three crore card passages.

The equipment consisted of seventeen tabulator units with necessary auxiliary machines, of which eight units were at Calcutta, five at Delhi and four at Giridih. The machine tabulation wing at Delhi was shifted this year from the Army Statistical Organization, Ram Krishna Puram, to Hauz Khas.

The NSS Division of the Indian Statistical Institute was reorganized in August 1966, in accordance with the recommendations of the Statutory Committee and Dr. Debkumar Bose joined as its Head. All operational centres at Baranagar, Giridih and Delhi, the Design and Appraisal Unit at Baranagar, both the Special Units and the field branches in West Bengal and Bombay city were placed under the Head from 10 August 1966. Dr. Bose was also made a Joint Secretary of the Indian Statistical Institute.

Eight technical seminars on different topics were organized by the Sampling Design Section and workers of the NSS participated.

The field survey of the twentieth round (NSS) in West Bengal was completed in June 1966 and the survey for the twenty-first round which commenced in July 1966 is still in progress.



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The NSS programme of work committed to the Government of India for 1966-67 was completed in respect of all the end-results. In addition to the end-results of 23 items which were committed for 1966-67, seven more items, the end-results of which were promised to be delivered in earlier years, were also submitted.

Ten reports were printed and 33 draft reports submitted to the Government of India during the year under review (*Annexure 6*).

A list of papers published by the workers and those sent for publication is given in *Annexure 5*.

#### 11. APPRAISAL DIVISION

The Appraisal Division was formed to carry out activities related to the first two objects of the Institute as given in the Memorandum of Association.

Consistent with the first object, research on a new statistical methodology for educational and psychological measurement was conducted during the period under review and partially reported in a paper, "Some observations on educational evaluation by sampling universes of questions" by Professor P. C. Mahalanobis and Dr. Rhea S. Das. The research project on affective meaning systems in Bengali, conducted in collaboration with the Centre for Comparative Psycholinguistics, University of Illinois, U.S.A., was continued and the first two phases completed. The pilot stage of the project on age-related changes in affective and cognitive meaning systems, initiated with the cooperation of the Centre de Gerontologie de l'Association Claude-Bernard, Paris, was concluded.

By way of furthering the second object of the Institute, research consultation and technical assistance were provided for the Jagdish Bose National Science Talent Search; N.C.E.R.T. Language Achievement Research Project; Banaras Hindu University; Gorkhpur University; Calcutta University; and the Education Department, Government of Tripura. The staff provided technical psychometric services within the Institute and participated in the teaching programme of the Research and Training School.

One paper was published and six papers were submitted for publication (*Annexure 5*). One research scholar completed research for a thesis to be submitted for the Ph.D. degree of the Institute. Dr. Rhea S. Das is in charge of the Division.

#### 12. ELECTRONIC DIVISION AND THE ISI-JU JOINT COMPUTER PROJECT

The Institute has been a pioneer in the field of electronic computers. The Electronic Division of the Institute had designed and constructed the first electronic computer in India in 1953, an account of which was published in the *American Review of Scientific Instruments* in 1955. The Institute also installed the first electronic computer in India (British HEC-2M) in 1956 and the second computer in India, the Soviet URAL, received as a gift from the USSR through the United Nations in 1959.

In 1961, a scheme was drawn up in collaboration with the Jadavpur University for computer development. The ISI-JU Project was for building two computers, the first in the Jadavpur University and the second in the Indian Statistical Institute. As a result of this collaboration, a modern solid state computer was designed and built in the Jadavpur

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University by the joint efforts of the workers of the Institute and the University. This was commissioned by the Minister of Education on 2 April 1966. The computer, however, could not be operated continuously for lack of certain facilities and serious fluctuation in the voltage of electric current. These drawbacks could not be remedied for lack of funds. The projected data-link between the Jadavpur University and the Indian Statistical Institute could not be completed for the same reasons.

*Research* : Among different types of research work carried out by the Division may be mentioned the following : 1. the development of computer memory. 2. the design of a low-cost general purpose computer, and 3. preliminary work on the recognition of the human spoken word by the machine.

One paper was published and four papers sent for publication (*Annexure 5*).

### 13. DOCUMENTATION RESEARCH AND TRAINING CENTRE (DRTC), BANGALORE

The results of the examination for the 1965-66 batch of eight trainees, who completed the course on 31 December 1966, were announced in March 1967. Of the six results announced, two candidates secured distinctions. The seven trainees of the 1966-67 batch took the post-course apprenticeship in the Indian Statistical Institute from 15 April to 7 June 1967.

*Publications* : The revision of the book, *Prolegomena to library classification*, Ed-3, by S. R. Ranganathan, was completed and the revised copy sent to the press. *Library service for all*, edited by S. R. Ranganathan and A. Neelamegham, was published. The revision of the book, *Social bibliography : Physical bibliography for librarians*, by S. R. Ranganathan, was taken up. The papers and proceedings of the DRTC Seminar (4) (1966) were published in a mimeographed volume.

*Research* : Important features of the research work at the DRTC have been given in the Research Summary.

The following two visiting scholars worked at the D.R.T.C. during the year : Shri S. V. Sangameswaran, scientist (Library), Central Food Technological Research Institute, Mysore, and Shri A. P. Srivastava, Head, Department of Library Science, University of Rajasthan.

*Seminar* : The Fourth All India Seminar on Documentation, held from 23 to 27 December 1966 at the D.R.T.C., was inaugurated by Dr. S. R. Ranganathan, National Research Professor in Library Science. The subjects discussed were : (i) Universe of Subjects: Its Structure and Development ; (ii) Design of Depth Schedules ; and (iii) Use of Documentation List in Libraries. Twenty-six papers, including three from abroad, by 25 contributors, representing 16 institutions, were accepted for discussion. About 80 delegates from all over India attended the seminar.

The D.R.T.C. staff read 14 papers at the Fourth All India Seminar on Documentation, 23-27 December 1966, and at the technical session of the "Standards for Technical Editors and Publishers", Tenth Indian Standards Convention held at Ernakulam, 26-31 December 1966.

Twenty-four propositions were discussed at the meetings of the Library Research Circle which were held regularly in the D.R.T.C. Twenty-five weekly colloquia by visiting

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professors and trainees were also organized. The Board of Studies met on 28 December 1966.

During the period, the D.R.T.C. Library received 121 books, 116 reports/reprints, and 16 new periodicals.

Fifty-two articles were published and 10 sent for publication by the staff of the D.R.T.C.

#### 14. LIBRARY

The collection of the Central Library at Baranagar (with branches at Giridih, Delhi, Bombay and Bangalore) came to 1,14,220 books and bound journals, 29,000 reprints, monographs, specialised technical reports, and also a large collection of microfilms and photo-prints.

The purchase of reading materials from abroad had to be curtailed considerably due to the devaluation of the rupee. During the year, the library acquired 3,704 volumes, of which 3,500 were released for circulation, compared with 4,095 volumes last year. The total number of periodicals received came to 2,326. The library also acquired a set of micro-films of the late M. N. Roy archives. Scientific and technical publications in Russian were received from agencies in the U.S.S.R. under a publication exchange programme.

The library issued documentation lists and compiled subject bibliographic and reading lists on different subjects. The library collaborated with the Indian National Scientific Documentation Centre (INSDOC) to publish the "Catalogue of serials in the Indian Statistical Institute Library" (Union Catalogue, Ser. 3).

The workers' circulating library had a collection of 21,933 at the end of the year.

Among other routine activities may be mentioned the news-clipping service, documentary reproduction work, and scientific photography. The Museum and the Records Unit made systematic acquisitions, indexing and filing specimens, maps and other materials. Inter-library loan transactions were made with 24 local and out-station libraries.

Two papers by staff members were published and four sent for publication (*Annexure 6*).

#### 15. STATISTICAL QUALITY CONTROL

The SQC Division of the Institute was established with the principal object of fostering the use of SQC techniques in Indian industries with a view to improving the quality of their products, increasing productivity and reducing costs. It functions under the general guidance of the Policy Advisory Committee for SQC which is being re-constituted by the Government of India. The activities of the Division were carried out through its nine operating centres all over the country, viz., Bangalore, Baroda, Bombay, Calcutta, Coimbatore, Delhi, Madras and Ernakulam, with a sub-unit in Trivandrum.

The Training and Promotional Unit of the SQC Division located at Calcutta organized the one-year Post-graduate Diploma Course in SQC, specially designed to meet the growing demand for professional SQC practitioners in the country. It also organized other training and promotional activities. Special courses were also conducted at the request of the Ministry of Defense, Government of India.

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*Promotional Activities* : The technical officers of the Division gave 54 lectures and talks to industrial and management personnel, members of various professional bodies and institutions. The units organized seven seminars and symposia and their technical personnel attended 34 seminars and conferences etc., organized by agencies in different parts of the country. Promotional visits were paid to 125 plants, and 38 pilot studies were conducted in establishments not covered by the professional service and 29 reports were submitted.

*Publications* : Seven technical papers were presented at conferences and some are likely to be published in journals. Specially tailored manuals were prepared for each of the training courses. The revised brochure on *Statistical Quality Control—some applications in the Indian textile industry* and the *Ready Reckoner to determine the profit per spindle for use by top management of textile mills* were extensively circulated to interested people in industry, Governments, and other organizations. These publications were well received and commended by, among others, Sri Manubhai Shah, Central Minister for Industries and Commerce. The Training and Promotional Unit also completed arrangements to bring out a special SQC news-letter to create a greater awareness of SQC methodology and their wider utilization.

*Training Courses* : The development of SQC in the country has been achieved largely through the training of personnel at different levels and the Indian Statistical Institute has been continuously engaged in this important programme of training and education. Apart from the usual basic courses, several special courses relating to Reliability Engineering, Operations Research, Data Processing and Presentation to Management, Industrial Experimentation etc., were organized during the year. Special industry-wise courses were also organized for the sugar and textile industries.

A large number of in-plant training courses conducted during the year were found to be particularly useful in stimulating the interest of plant personnel in the efficiency of SQC methods, both in increasing productivity and reducing costs. Fourteen general and eight special courses conducted during the year were attended by 440 persons, compared with 119 in the previous year. These include five courses specially organized for defence personnel, of which two were at an advanced level for the senior officers and trainees of the Ordnance departments.

The one-year Post-graduate Diploma course, specially devised to train engineers, technologists, scientists and statisticians in the theory and practice of statistical quality control to a level of professional competency, was revised in the light of the experience gained during the past years. During the current session, 32 candidates were admitted, of whom 15 were sponsored by the Ministry of Defence, Government of India. A large number of in-plant training courses essential for creating a receptive climate for SQC in a plant and for the training of plant personnel at different levels for the proper installation and running of a quality control system in an organization were conducted during the year. During the period, 525 plant personnel were covered through 21 such courses.

The details of the training courses are given in *Annexure 3*. The courses were conducted by all the units and 965 persons participated. The SQC units also undertook the on-the-job training of the junior staff and apprentices. Special in-plant field training was also organized for the students of the SQC diploma courses. Eleven apprentices were receiving training during the year.

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*Plant service :* During the period, professional service was rendered, on a regular membership basis, to 71 plants. While 16 new organizations were taken up for SQC services, the SQC units withdrew from 20 plants after assisting them to organize their own SQC cells.

In a few of the public sector industries, the work made definite progress, and persons trained in the application of SQC methods were, therefore, able to take over the working of the SQC systems organized in these industries.

Four hundred and thirty-eight technical reports were submitted to the plants on the projects taken up in member organizations.

*Foreign experts :* The services of Dr. Samuel S. Shapiro, a United Nations Expert in Statistical Quality Control and Industrial Engineering, working in the Research and Development Department, General Electric Co., New York, were available to the SQC Division from 17 April 1966 to 2 March 1967. Utilising his specialized knowledge and experience, special training courses were conducted in the techniques of Reliability Engineering. He imparted on-the-job training to the junior staff during their work in plants and projects. He was also engaged in organizing a system for quality functions in both the private and public sector plants.

*Staff :* Two members of the technical staff were sent abroad for training during the year.

*Liaison with other organizations :* The SQC units worked in close co-operation with sister organizations like the Indian Standards Institution, National and Local Productivity Councils, Institutes of Management, Indian Society for Quality Control, Institute of Production Engineers, Institute of Electronic and Radio Engineers, Small Scale Industries Services and Training Institutes, Indian Productivity Year Committee, Management Associations, Operations Research Societies, National Institute for Training in Industrial Engineering, IBM World Trade Corporation, Universities and Governmental agencies. The programmes of collaboration included participation in seminars and conferences, training programmes, contribution of papers, organization of special courses, productivity exhibitions and similar other items. Two technical papers were contributed by members of the staff at the Tenth Indian Standards Convention held at Ernakulam in December 1966. Two papers were also contributed to the Twenty-fourth All India Textile Conference held at Kanpur in March 1967.

#### 16. UNTAA (DEVELOPMENT) WORKSHOP

Early in December 1965, the Government informed the Institute that they would not pay any grant for the UNTAA sector after 31 March 1966. The matter was considered by the Council on 10 December 1965. After considering various factors, the Council decided to continue the sector up to May 1966, pending exploration of possibilities for continuing the sector. In May 1966, the Council decided to close down the UNTAA sector and transfer the personnel and a part of the UNTAA equipment to the Garden Reach Workshop Ltd. (GRW), a Government of India undertaking, which had agreed to the take-over. Accordingly, notices of termination of services were served on the workers of this sector. This notice became temporarily ineffective as some of the workers had obtained a Rule and an Interim Injunction from the High Court prohibiting the Institute from closing down

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the UNTAA sector. The High Court finally disposed of the Rule on 8 September 1966 and the judgement went against the Institute. An appeal was thereafter filed before a Revision Bench of the High Court. During the pendency of the appeal, an agreement was reached with the workers that they would go over to the ORW with effect from 23 November 1966. A few workers who were not taken over by the ORW were retained in the services of the Institute for maintenance work. Thus the UNTAA sector was closed down with effect from 22 November 1966. The appeal filed in the High Court was, therefore, withdrawn on the basis of a decision of the Council.

### 17. FAMILY PLANNING RESEARCH UNIT

The activities of this Unit pertaining to family planning includes (i) communications research, (ii) surveys, (iii) drawing up of action programmes and their operation, (iv) maintenance of the supply-service-information system.

The above-mentioned activities are maintained through three projects conducted by the Unit : (i) An institutional study, (ii) a study of the general population of Calcutta City, and (iii) a fertility study.

The action programme is being developed in the Calcutta City project through (i) mass media such as exhibition, film shows, tarja recitals, distribution of leaflets etc., (ii) group meetings, and (iii) individual contacts. The voluntary group leadership programme was developed in the community for extension work. A clinic was opened in January 1967 for IUCD insertions and sterilization referrals.

For assessing changes in fertility behaviour of the target couples, a periodical survey was conducted. Some special studies were completed for measuring attitudes through scaling techniques, for studying the communication aspect of exhibitions and for measuring changes in knowledge.

A baseline fertility survey was conducted in the Hooghly District.

### 18. PUBLICATIONS

The following were published :

*Sankhyā : The Indian Journal of Statistics* : Volume 28, Series A, Parts 2, 3 and 4 ; Volume 29, Series A, Part 1 ; Volume 28, Series B, 4 parts.

*Samvadadhvam* : The House Journal of the Indian Statistical Institute, Vol. 7, No. 1.

### 19. VISITORS

Over 250 visitors from India and abroad (from 18 foreign countries and international organizations) came to the Institute during the year.

### 20. CONSTRUCTION OF BUILDINGS

From 1962 to 1966, floor space to the extent of 86,000 square feet of *pucca* buildings and 17,000 square feet of *pucca* sheds, including the UNTAA workshop, were constructed.

Out of the total space so far constructed, about 78,500 square feet of *pucca* buildings and 17,000 square feet of sheds were made habitable and are under use.

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### 21. BRANCHES

21.1. *Mysore State Branch* : There were 42 members of different categories at the end of the year. The office-bearers and members of the Executive Committee of the Branch for 1966-67 were elected at the thirteenth annual general body meeting held on 4 June 1966.

The admission tests for the M.Stat. and B.Stat. degree courses and the SQC diploma course were held at the Bangalore Centre on 10 July 1967. The professional examinations in statistics were also held at the Bangalore Centre from 18 to 30 November 1966. The admission test for the Indian Institute of Management, Calcutta, designed by the Psychometric Unit (RTS), Indian Statistical Institute, was held at the Bangalore Centre on 5 March 1967.

A Training Course on Industrial Statistics was organized by the Branch, in collaboration with the Mysore State Productivity Council, from 15 April to 21 July 1966 and 29 candidates from the industries participated. The teaching faculty consisted of specialists from the local SQC Unit, Hindustan Aeronautics Ltd., National Productivity Council, Indian Institute of Science and Bangalore University.

21.2. *Bombay Branch* : Two meetings of the Council were held on 29 April and 23 September 1966. The office-bearers for 1966-67 were elected at a meeting of the General Body held on 9 November 1966.

*National Sample Survey* : The field work for the twentieth round of the NSS was completed by 31 July 1966. The Post-Census Survey on live-stock numbers for the sixth sub-round of the twentieth round was also completed. The field work for the twenty-first round started in August 1966.

*Evening Course* : The five candidates who passed the One-year Evening Course in Statistics for 1965-66 were awarded the certificates. An admission test was held on 10 July 1966 for 30 candidates who applied for the evening course for 1966-67. Twenty-eight candidates appeared for the test, of whom 22 were recommended for selection and 13 candidates were finally admitted to the course. Of the six candidates who appeared for the Part I examination, four passed and two were declared to have passed provisionally.

*Statisticians' Diploma Examination* : The Statisticians' Diploma Examinations were held in May and November 1966. Eight candidates appeared in May, and nine appeared in November.

*Visiting Scientists* : Among the foreign scientists who visited the Bombay Branch may be mentioned : Professor R. C. Boss, Department of Statistics, University of North Carolina, U.S.A., who came in connexion with the Advanced Summer School for Statisticians held in Bombay ; and Dr. V. G. Rastnyanikov, Institute of Asia, USSR Academy of Science, who gave a lecture.

*Specialized Training* : Three U.N. Fellows were in Bombay for a week in December 1966 for learning the field work of the National Sample Survey. A trainee from Syria attending the International Statistical Education Centre, Calcutta, came for a week for specialised training at the Reserve Bank of India, Bombay.

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*Library* : The Institute Library at Bombay has a total collection of 978 volumes of books and bound journals and 501 periodicals. During the year, the library acquired 115 books and 55 periodicals. The library participated in inter-library loans.

21.3. *Kerala Branch* : The Branch had 16 members, including four who were admitted during the year. The Management Committee had five members.

The main activity of the Branch continued to be the conducting of the One-Year Evening Course in Statistics. The two students who had been admitted to the course in September 1965 took the Part II examination in August 1966, completed the course and passed the examination with distinction. Ten candidates were admitted, out of the 13 who applied for the Part I examination of the evening course and eight appeared in March 1967. Four part-time teachers conducted the training.



## RESEARCH SUMMARY

A brief account is given in this section of the progress of research in the different divisions and sections of the Institute. The lists of scientific and technical papers published or submitted for publication are given in Annexure 5.

## RESEARCH AND TRAINING SCHOOL

## 1. MATHEMATICS

1. *Some probabilistic implications of automorphisms of finite rings of operators* : A finite ring of operators is the non-commutative analogue of bounded random variables on a probability space. In the present paper, it is shown that any automorphism of a finite ring can uniquely be extended to an automorphism of the algebra of all measurable operators onto itself. This extended map is bitcontinuous in the topologies of convergence in probability and convergence nearly everywhere, but may fail to be so in the topologies of  $L_p$  convergence,  $p=1, 2$ .

Under the additional assumption that the automorphism leaves the center of the ring elementwise invariant, it is proved that its extension preserves  $L_p$  convergence and conditional expectation. Further any self-adjoint measurable operator  $T$ , and its automorphic image turn out to be, in some sense, identically distributed random variables and the successive automorphic images of  $T$  constitute a (non-commutative) stationary stochastic process.

2. *Ideals in some special lattices* : In this paper is studied ideals in (i) the lattice  $L$  of all topologies on a set  $X$  and (ii) the lattice of all finite measures on a measurable space  $(Y, S)$  where  $Y$  is a compact Hausdor space and  $S$  the  $\sigma$ -field generated by all compact subsets of  $Y$ . A characterization of maximal  $L$  is obtained. A partial ordering is introduced on  $G$ , the family of all totally finite measures on  $(Y, S)$ . It is then shown that under this ordering  $G$  is a lattice and that  $R$ , the subfamily of all regular measures in an ideal is  $G$ . A characterization of a cover in  $R$  is obtained. Finally, two counter examples are given to show that this characterization is not valid in an arbitrary sublattice of  $G$ .

## II. PROBABILITY

3. *Alternative proofs of some theorems on characteristic functions* : Let  $\phi(t)$  be a characteristic function. Then  $\phi(t) \exp(-t^2/2)$  is absolutely integrable. This fact and the inversion formula for the normal distribution are exploited here to provide alternative proofs of the uniqueness, Levy's continuity and Bochner's theorems on characteristic functions.

4. *On a characterization of multivariate normal distribution* : It is known that a  $p$ -variate normal random variable  $X$  can be characterized in two equivalent forms :

(1) Every linear function of  $X$  is univariate normal.

(2)  $X$  has the representation  $X = \mu + BG$  where  $\mu$  is a  $p$ -vector of constants,  $B$  is  $p \times r$  matrix of rank  $r$  and  $G$  is  $r$ -vector of independent one dimensional normal variables with zero mean. The matrix  $B$  in the representation is not, however, unique. The non-uniqueness of  $B$  is exploited in the following characterization of the  $p$ -variate normal distribution.

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**Theorem:** Let  $Y = \mu_1 + B_1 G_1$  and  $Y = \mu_2 + B_2 G_2$  be two representations of a  $p$ -dimensional random variable  $Y$  terms of vectors  $G_1, G_2$  of non degenerate independent random variables (not necessarily univariate normal), where  $B_1$  and  $B_2$  are  $p \times m$  matrices of rank  $n$ , such that no column of  $B_1$  is a multiple of some column of  $B_2$ . Then  $Y$  is a  $p$ -variate normal variable.

5. *Characterisation of the distribution of random variables in linear structural relations:* The paper examines the nature of the latent random variables which occur in linear structural models, under the assumption that they are independent. It is shown that alternative representations with different sets of coefficients for the latent variables or different numbers of latent variables are possible when and only when some of the latent variables or some of their linear combinations have a univariate normal distribution. The investigation has applications in the problem of identifiability of parameters in linear structural relations. An important characterization of the multivariate normal distribution is deduced.

6. *On some characterisations of the normal law:* A characterisation of the normal distribution by the constancy of regression of one linear function of independent variables on other linear functions is established. Thus, the property  $E(x|z_1, \dots, z_n) = 0$ , i.e. the conditional of the average  $x$  given any one residual  $(z_i - x)$  in a sample of  $n$  independent observation  $z_1, \dots, z_n$  from a distribution with a finite second moment implies that the distribution of  $x$  is normal. A series of similar results are obtained.

7. *On one-sided distribution functions:* It is established that a necessary and sufficient condition for a distribution function (d.f.)  $F$  on the real line to be bounded to the left is that its characteristic function  $f$  be extendible to the upper half-plane and analytic and of exponential type in the open half-plane. The left extremity of  $F$  is then

$$= - \lim_{y \rightarrow \infty} \ln f(iy)/y$$

A dual result holds for d.f.'s bounded to the right. These results are specialized to infinitely divisible laws and in particular to stable Laws.

8. *Problems relating to the existence of maximal and minimal elements in some families of statistics (sub-fields):* In statistical theory, one comes across various families of statistics or sub-fields. For each such family it is of some interest to ask whether the family has maximal and/or minimal elements. In this paper, the author proves the existence of such elements in a number of cases. A number of problems of an allied nature is also discussed.

9. *On sufficiency and invariance:* Given a statistical model  $(X, \phi, \mathcal{P}$  a one-one bi-measurable transformation of  $(X, \phi)$  onto itself is called model-preserving if  $p_{\phi^{-1}} = \mathcal{P}$  for all  $P \in \mathcal{P}$ . Let  $G$  be the class of all model-preserving transformations. If a minimal sufficient sub-field  $\mathcal{L}$  exists, then it is shown that  $\mathcal{L}$  must be almost  $G$ -invariant. In many familiar situations it is true that the minimal sufficient sub-field is equivalent to the sub-field of all almost  $G$ -invariant sets. The problem of data reduction in the presence of nuisance parameters is examined in some details. It is shown that in many situations the principle of invariance is strong enough to lead us directly to the standard data reductions.

10. *On invariant sets for location-parameter families of probability measures:* The phenomenon that in some location-parameter families of probability measures there exists non-trivial sets with constant measures has been studied in detail.

## III. GRAPH THEORY AND COMBINATORIAL MATHEMATICS

11. *On colouring a polygon and restricted random graph*: Let  $D$  and  $R$  be two finite sets of elements. Consider the collection of all mappings  $S$  of  $D$  into  $R$ . Using a group which acts as a permutation group on  $D$ , equivalence classes of mappings in the set  $S$  are formed. The number of equivalence classes has been obtained explicitly here in certain class of problems. Taking the sides of a polygon for  $D$  and a set of colours for  $R$ , under the cyclic group of permutations on the vertices of the polygon  $D$  which defines equivalence of two colourings, the number of inequivalent patterns of colouring the number of inequivalent patterns with given numbers of sides coloured with given colours and the number of equivalent colourings to a given specific colouring are obtained. In case we take two colours only, the problem reduces to finding the number of non-isomorphic and non-reflective graphs on  $n$  vertices where the set of edges is restricted. Problems connected with colouring at random and probabilities of observing a specific structure are also studied at the end. These solutions could be of use in assessing the morphology of certain plants like cactus and some flowers and their stamens and will appear elsewhere in detail.

12. *On some external graphs*: Let  $G_{k,s}(n, k, l, s)$  denote the class of all graphs on  $n$  vertices which are  $k$ -accessible (i.e. with diameter  $\leq k$ ) and which remain  $l$ -accessible when any  $s$  points (edges) are removed. The external graphs (having a minimal number of edges) in the class  $G_{k,s}(n, k, l, s)$  are found for  $k=2, 1 \geq 3, s=1$ .

13. *Statistical analysis of sociological structures*: Consider a group of  $N$  individuals. Let a vector of  $n$  distinct integers  $1, 2, \dots, n$  be associated with every individual. The distance between two individuals is defined as the number of places in which their vector differs. The distance of an individual from the group is defined as the sum of his distances from all the individuals of the group. A centre is defined as a vector among the  $N$  which has minimum distance from the group. For a given vector let  $p_n$  be the proportion of individuals who have the same vector associated with them. Then this vector is a centre of the group if  $p_n > n/(n+2)$ . It is the unique centre if  $p_n > (n^2+n-2)/(n^2+n+2)$ .

Let  $t$  individuals be selected at random from the  $N$  individuals without replacement. For this sample, take any of its centres as an estimate of the group centre. Assuming the group centre to be unique let  $\bar{d}$  be the average distance of the estimate from the group centre. If  $\bar{d} < \bar{d}_n$  a predetermined value then the sample size

$$t > [\log(n^2+n-2-2\bar{d}_n) - \log(n^2+n-2)] \log p_n.$$

Let, with respect to the unique centre,  $x_j$  be the subgroup individuals who are at distance  $j$  from the centre,  $j=0, 2, \dots, n$ . Let  $G$  be the influence graph of the  $N$  individuals with connected components  $G_i$  consisting of individuals of subgroups  $Y_i$ ,  $i=1, 2, \dots$ . If the two partitions have no overlapping then the centre is stabilised, otherwise consider a condensed graph with  $X_i$  as vertices and the number of arcs connecting the individuals of the subgroup  $X_i$  to those of  $X_j$ . We rank these  $n$  vertices according to the ratio vector. The shift of the centre in the next instant of time is indicated by the ranks of the subgroups  $X_j$ .

14. *A note on symmetric balanced incomplete block designs*: For the SBIB designs with parameters  $v=(s^2-1)/(s-1)=b$ ,  $r=(s^{2-1}-1)/(s-1)=k$  and  $\lambda=(s^{2-1}-1)/(s-1)$

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two solutions, one by taking the points of a finite projective geometry  $PG(2t-1, s)$  of  $n$  dimensions based on a Galois field of order  $s$  as treatments and  $(2t-2)$ -dimensional hyperplanes of the geometry as blocks and the other by taking the points of nondegenerate quadric  $Q_n$  in  $PG(2t, s)$  as treatments and all its tangent cones of order 1 as blocks are known. In this note, the two solutions are shown to be non-isomorphic. Fisher and Yates tables show the former solution above in the case of  $v=b=15$ ,  $r=k=7$ ,  $\lambda=3$  and here the non-isomorphic solution is also displayed for these parameters.

15. *On forms of quadrics in finite projective geometry*: Consider a second degree homogeneous equation in a finite projective geometry of  $(2y-1)$  dimensions based on a Galois field of odd order  $s$ . Let  $A$  be the matrix of the equation. In the *Journal of the Indian Statistical Association* (1965), the author has characterised the elliptic and hyperbolic quadrics in some cases using induction hypothesis. In the present paper, using algebraic results on the number of solutions for second degree homogeneous equations, it is proved that the form represented by  $A$  is elliptic or hyperbolic according as  $(-1)^y$  determinant  $A$  is a non-square or a square element of the field.

16. *Cyclical generation of linear subspaces in finite geometries*: The paper describes methods by which all linear spaces of a given dimension in a finite Projective or Euclidean geometry can be cyclically generated, starting from an initial set of such linear spaces. It also establishes the existence of spreads in finite geometries and provides rules for cyclical generation of disjoint spreads.

The results are derived by representing the points of a geometry by elements of a Galois field or by integers representing the powers of a primitive element. It is shown that given a subspace with points represented by integers, another subspace of the same dimension can be generated by adding a fixed integer to each of the integers of the given subspace and reducing the results to mod  $v$ , where  $v$  is the total number of points in the geometry. Thus by adding, 1, 2, ..... it is obtained a maximum of  $v$  different subspaces. However, the number of different subspaces may be  $\theta$  less than  $v$ . The number of  $\theta$  is called the cycle of the given subspace. The necessary and sufficient condition for the existence of subspaces of cycle  $\theta < v$  and the construction of such subspaces are discussed.

It is shown that the set of all subspaces generated by a subspace of cycle  $\theta$  constitute a  $\mu$ -fold spread of the geometry, i.e., each point of the geometry is contained in exactly in of the subspaces of the set.

## IV. SAMPLING

17. *On an exact  $n$  PS sampling*: In sampling a finite population for the estimation of population total, it is sometimes advantageous to select a sample of effective size  $n$  such that the inclusion probabilities of the units of the population are proportional to some auxiliary measure known as size in the literature. A selection method appropriate for this is given in this paper.

Let  $p_i$  denote the size of the  $i$ -th unit  $u_i$ . Without loss of generality we assume that

$$p_1 < p_2 < \dots < p_N$$

and  $\sum_{i=1}^N p_i = 1$ . Also  $p_i$  denotes  $\sum_{j>i} p_j$ . If  $P_{N-s+1} = p_N$ , the units in the sample are picked

up one after the other in the following manner : assuming that it is chosen  $k-1$  units  $u_1, u_2, \dots, u_{k-1}$  in the sample ( $i_1 < i_2 < \dots < i_{k-1}$ ), choose  $k$ -th unit with selection probability for  $u_j$  being  $(1-n-kp_{u_{k-1}}+1) \dots (1-n-kp_{j-1})(n-k+1)p_k / \sum_{i>i_{k-1}} p_i$  if  $i_{k-1} < j < N-n+k+1$  and 0 otherwise. We take  $i_k$  always as zero. If  $P_{N-n+1} < P_N$ , choose one number from  $1 \dots n$  with selection probability of  $i$  being  $n(p_{N-n+i+1} - P_{N-n+1})/S$  where  $S = p_1 + \dots + p_{N-n}$  and  $p_{N-n} = 1/n$ . If the selected number is  $k$ , we choose a sample of size  $k$  from the first  $N-n+k$  units using the above method with revised size measure  $p'_i = p_i / (S + kp_{N-n+1})$  if  $i \leq N-n$  and  $p'_i = (p_{N-n+1}) / (S + kp_{N-n+1})$  if  $i > N-n$  and adjoin the last  $(n-k)$  units.

It can be easily seen that by this method the inclusion probabilities are strictly proportional to the size measures. Based on the sample obtained this way, a stable non-negative estimate of the variance of the estimate of the population total can be obtained.

18. *Inadmissibility of customary estimators in sampling over two occasions* : Inadmissibility of customary estimators of population total in sampling over two occasions is demonstrated by providing more efficient estimators under (i) equal probability sampling scheme and (ii) varying probability sampling scheme. Expressions for the gain in efficiency of the improved are derived.

19. *On the choice of a strategy for ratio method of estimation* : The sampling strategies (i)  $N_M$  consisting of the Midzuno-Sen sampling scheme and the estimator  $(\sum y_i / \sum x_i) X$  of the population total  $Y$  (ii)  $N_{H,\pi_i}$  consisting of the Midzuno-Sen scheme and the estimator  $\sum y_i / \pi_i$  where  $\pi_i$  is the probability of inclusion of the  $i$ -th unit in the sample and  $i : u_i \in S$  (iii)  $N_{H,\pi_i}$  consisting of the  $nPS$  sampling scheme and the estimator  $(X/n) \sum y_i / x_i$  of  $Y$  are considered and it is shown that the strategy  $N_{H,\pi_i}$  is suitable for the method of ratio estimation. A direct application to cluster sampling is also mentioned.

20. *On the allocation of sample size in stratified sampling* : The problem of optimum allocation of sample size to strata is examined in the light of a priori distributions. In this context, the justification for the assumption that the unknown proportionate values of  $\sigma_i^2$ 's can be replaced by the proportionate values of the known  $\sigma_i^2$ 's, which are estimates of  $\sigma_i^2$ 's is discussed. Allocation of sample size to strata which minimizes the expected variance of the strategy consisting of  $nPS$  sampling scheme and the Horvitz-Thompson estimator under a general super-population model is derived. It is further shown that, in the sense of equal expected variance  $nPS$  sampling for unstratified sampling is equivalent to  $nPS$  stratified sampling with this type of allocation.

#### V. STATISTICAL METHODS

21. *Step-down multiple decision rules* : Consider a random variable  $X$  whose distribution involves a parameter  $\theta$ . Let  $w_1, \dots, w_k$  be a partition of the parameter space. The problem is to choose one of the possible decision :  $\theta \in w_i$ . We consider only those rules for which the probability of deciding  $\theta \in w_i$  is fixed (equal to a prescribed number  $a_i$ ) when  $\theta \in w_i$ ,  $(\dots)_{w_i}$  ( $i=2, \dots, k$ ). Under certain assumptions about the distribution and the structure of the sets  $w_i$ , and subject to the above restrictions, it is found a rule which simultaneously maximizes the probabilities of correct classification. This kind of problem was first posed by Anderson, 1962, (*Ann. Math. Stat.* 33, 265-281) for some specific cases.

This is formalized here in a more general set-up and certain specific problems in analysis of variance and in normal multivariate analysis are discussed in this light. In particular, the step-down test for testing  $\mu=0$  in  $N_p(\mu, \Sigma)$  and the step-down test for testing that  $\Sigma$  is a diagonal matrix, are reviewed and the optimum solutions for both the problems are obtained after formulating the problems in the above multiple decision set-up. An important concept of 'weakly unbiased rule' is introduced for multiparameter multiple decision problems and its role is illustrated through some examples.

22. *Extensions of fractile graphical analysis to higher dimensional data*: The technique of fractile graphical analysis (FGA), in the form of bivariate graphs, was developed and applied in the analysis of economic data in a series of papers by Mahalanobis from 1958. The wide applicability of this method was demonstrated in recent papers by Linder, Rhea Dea, and others. Some conjectures made by the author were studied in a number of theoretical papers by Kawada, Kitagawa, Mitrafanova, Sethuraman and Takeuchi. The computational aspects through the use of electronic computers were examined by Roy and Kalayanasundaram. The object of the present paper is to provide further theoretical foundations of FGA and extend it to higher dimensional data.

23. *Methods for determining norms and growth rates—A study amongst Indian school-going boys*: The paper deals with the statistical analysis of measurements obtained on school-going boys of various ages for estimating norms and growth rates, in what is termed as an LCS (Linked Cross-Sectional) study. This is a cross between a longitudinal study where some boys are chosen at a fixed young age and are measured periodically over a certain number of years covering the range of study and a cross-sectional study where boys of different ages are chosen and each boy is measured only at one age and at one point of time. In an LCS study, boys of different ages are chosen and each boy is measured periodically over a comparatively smaller number of years. Thus if one is interested in studying growth of boys between the ages of 5 and 16, a certain number of boys at each age (between 5 and 16) may be chosen and measured on three consecutive birth days. The study is thus restricted to a period of about two years, whereas in a longitudinal study the period will be about 11 years. The advantages of such a short-range study compared to a purely longitudinal study extended over a large number of years are explained.

24. *Tables of the non-centrality parameter of F-test as a function of power*: The noncentrality parameter ( $\delta$ ) of the power function of the analysis of variance F test is tabulated as function of two degrees of freedom ( $M$  and  $N$ ), the level of significance ( $\alpha$ ) and the power ( $\beta$ ) of the test. Values of  $\delta$  are presented for  $M=1(1)10$ ,  $N=10(5) 50(10)100$ ,  $\alpha=0.01$  and  $\beta=0.1(0.1)0.9$ . Application of these tables in the planning of statistical investigation involving one or more variable is also discussed in this technical report.

25. *A note on confidence bounds for certain ratios of characteristic roots of covariance matrices*: Let  $\Sigma_1, \Sigma_2, \dots, \Sigma_k$  be the covariance matrices of  $k$  p-variate normal populations. Let  $\lambda_{ij}$  be the  $i$ -th largest characteristic root of  $\Sigma_i (j=1, \dots, k, i=1, \dots, k)$ . In this paper, we obtain simultaneous confidence bounds on (i)  $\lambda_{i+1} / \lambda_{i+1}$ ,  $\lambda_{i+1} / \lambda_{i+1}$  ( $i=1, \dots, k-1$ ) and (ii)  $\lambda_{ij} / \lambda_{ip}$  and  $\lambda_{ip} / \lambda_{ij}$  ( $i=j=1, \dots, k$ ) by using methods similar to those of Khatri (1955, *Ann. Inst. Statist. Math.*, 17, 175-84). In case (ii), the confidence bounds are derived under the assumption equal sample sizes.

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26. *A generalized probit model for item analysis* : A model of response to multiple choice items which is formulated, takes into account the gradation of various alternative responses and the possibility of guessing different alternatives with different chances depending upon the ability of the subject. The parameters involved in this model generalise the notion of limen, to multiple limina. This introduces the concept of marginal limina useful in item analysis. Simple graphical procedures are suggested for the estimation of the parameters involved in this model (the limina and the proportions of guesses), as alternatives to the laborious maximum likelihood procedure.

27. *Sequential analysis* : In statistical theory, one comes across various families of statistics of sub-fields. For each such family it is of some interest to ask whether the family has maximal and/or minimal elements. The existence of such elements are proved in a number of cases.

Given a statistical model  $(X, \phi, P)$  a one-one bi-measurable transformation of  $(X, \phi)$  onto itself is called model-preserving if  $p^{-1} = P$  for all  $P \in \mathcal{P}$ . Let  $G$  be the class of all model-preserving transformations. If a minimal sufficient sub-field  $\mathcal{L}$  exists, then it is shown that  $\mathcal{L}$  must be almost  $G$  invariant. In many familiar situations it is true that the minimal sufficient sub-field is equivalent to the subfield of all almost  $G$  invariant sets. The problem of data reduction in the presence of nuisance parameters is examined in some details. It is shown that in many situations the principle of invariance is strong enough to lead us directly to standard data reductions.

It has been shown that the stopping time of a rank-order sequential tests based on Lehmann alternatives is finite with probability 1 and has a moment generating function under all parent distributions. This closes the gap occurring in the earlier work on the same subject. It is of interest to note that this is the second non-trivial sequential test whose stopping-behaviour has been determined under all parent distributions.

## VI. OPERATIONS RESEARCH, GAME THEORY, NETWORKS ETC.

28. *A note on resolution of degeneracy in transportation problems* : In this report, a method of obtaining optimal solutions to degenerate transportation problems has been suggested. This method is a modification of the already known Modified Distribution (MODI) method and appears to be more effective than the  $\epsilon$ -perturbation method, especially when the problem is highly degenerate. The method proceeds with only the non-zero cells of the basis and a dual solution corresponding to these cells—without attempting to complete the basis. Whenever there is a tie between two or more basis vectors, all of them are dropped from the basis, thus eliminating the problem of choosing only one of them. The method considers the possibilities of introducing more than one non-basic variables simultaneously into the basis. This decreases the number of iterations required to reach the optimum. The number of iterations wasted without improving upon the value of the objective function is controlled by exercising a proper choice of the dual variables that can be assigned arbitrary values.

29. *On the threshold order of a Boolean function-II* : Some properties and characterizations of switching functions by their threshold order are presented. The applicability of the Ho-Kashyap algorithm for testing and realization of a threshold function of order  $r$  is established. Comparison of these methods of realizing a switching function is made to

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KARZEMAN's procedure of determining a non-linear realization of a switching function. Tables of three-input switching functions classified by their threshold order and their parameters are presented.

30. *Defence of a system of dichotomies* : The notions of linear, logical and stochastic dependence, of  $n$  dichotomies, of order  $k \leq n$  are introduced. The connections between linear, logical and stochastic dependence are investigated. This includes generalizations of some well-known results on logical independence and the result that logical independence is a necessary consequence of stochastic independence, of a system of dichotomies. The concepts of logical independence and dependence have been applied to switching functions and relay-contact networks by previous authors.

31. *Transitional probabilities and the estimation of need for hospital services* : Models for estimating need for hospital services are presented which incorporate a probabilistic approach with a biological characterization of patients in terms of age, sex, and nature and severity of illness or disability. These models provide probabilities and estimators for three aspects of need for hospital services: hospital admissions, duration of hospital stay per patient and cost of hospitalization. The probabilities and estimators are formulated initially for a homogeneous population and a hospital system in which the medical services are undifferentiated. Biological heterogeneity of the population and qualitative differences in illness are taken into account by expressing probabilities and estimators in matrix form. Fluctuation in the level of severity of illness or disability is introduced explicitly by means of a matrix of transitional probabilities. Several levels of severity are to be defined which differ measurably from each other, and the matrix of transitional probabilities which is to be obtained expresses the probabilities of patients changing from one level to another during hospitalization. Based on the transitional probability matrix, estimators for the expected number of patients at each level on any day, expected duration of stay per patient, and expected cost of hospitalization are found.

32. *Game theory* : Satisfactory solutions have been obtained for compound simple games which are built out of two or more component simple games.

## VII. THEORETICAL PHYSICS

Research was continued at the Institute on the subject of elementary particle interactions on nuclei. The work carried out during the last year aims at taking the subject from the differential cross section or polarization analysis into the realms of a correlated study of the two types of observations. Considering the deuteron, the simplest and perhaps the most important nuclear target for elementary particle physics, it was found that a correlated study of the tensor moments of spin of the recoil deuteron together with the differential cross section could give an insight into the structure hitherto unknown, namely the relative phase between the  $s$  and  $d$  states and certain Mandel transforms of the  $s$  and  $d$  state radial distributions, in addition to providing estimates of the relative  $d$  state probability. In fact, a much simpler experiment was also suggested here to obtain estimates of the relative phase and probability of the  $d$  state from suitable observations on the differential cross section alone. The theoretical calculations have also been used to discuss some very recent experimental data (from Australia) on the recoil deuteron tensor polarization in proton deuteron collisions below 10 million electron volts. Two results emerged from this study: (i) even



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if the scattering is purely  $s$ -wave at low energies, the deuteron quadrupole moment leads to non-zero spin tensor moments, and (ii) that a comprehensive analysis taking into account also the contribution of the non-central force terms could yield estimates of certain parameters, governing the phenomenological nucleon scattering matrix, that have not been estimated so far at these energies.

33. *Quaternionic representations of compact metric groups* : Representations of compact metric groups in Hilbert spaces over the quaternions are studied. A generalization of the Peter-Weyl theorem is formulated and proved. The problem of finding all the irreducible quaternionic representations of an arbitrary compact metric group is solved and a rule is given for computing the 'q-characters' of all the irreducible quaternionic representations once the characters of all the irreducible complex representations are known. For the abelian case it is shown that every irreducible quaternionic representation is equivalent to a complex representation and hence one dimensional. An example is given of a non-abelian group whose irreducible quaternionic representations are all one-dimensional.

34. *Pion scattering on nuclei* : A general expression for the differential cross section for elementary particle interactions on nuclear targets based on the shell model of the nucleus and the impulse approximation is presented, taking into consideration the initial and final nuclear spins and the details of the nuclear wave functions. An extension of the method to the special problem of double charge exchange scattering is indicated. Numerical results obtained for elastic scattering of negative pions on  $^7\text{Li}$  using oscillator and square well models provide good agreement with experiment for scattering angles upto  $90^\circ$ . Relevant angular momentum coefficients for  $p$  shell calculations in  $L$ - $S$  coupling and the reduction factors for the  $^7\text{Li}$  problem are tabulated. Numerical results for inelastic scattering leading to the first excited state of  $^7\text{Li}$  are also presented as an example of the usefulness of the method to discuss inelastic processes leading to definite excited states of target nuclei and to aid comparison with the experiment where it is generally difficult to distinguish the inelastic contribution from this low lying level.

35. *Recoil polarization and structure of the deuteron* : An analysis for the deuteron structure is suggested which is based on observations of the recoil deuteron polarization tensors and the differential cross section in elementary particle reactions on the deuteron. The structure is completely characterised by defining non-relativistically five form factors and the different observables are expressed as homogeneous second degree expressions in terms of these. Considering the processes of pion scattering and photo production which are fairly well understood, suitable measurements are suggested leading to a determination of the structure. It is also shown that experimental study of the differential cross section at low values of momentum transfer together with the knowledge of the deuteron quadrupole moment could enable determination of the deuteron  $D$  state probability and to solve for the relative phase between the  $S$  and  $D$  states.

36. *Tensor polarization of deuterons following elastic scattering of protons* : The importance of the deuteron  $D$  state contribution to the second rank tensor polarization of the recoil deuterons in elastic nucleon-deuteron scattering is emphasized by showing that one could get non-zero values of the tensor moments even if the scattering is purely  $S$  wave at energies below 10 MeV. The numbers thus obtained for proton scattering however do not completely account for recent experimental observations which may, therefore, indicate in addition the contribution of non-central terms to the scattering.

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### VIII. RESEARCH IN SCIENCE UNITS

#### 1. BIOMETRY

Previously unreported hematological and circulatory correlates of blood groups have been identified by the statistical analysis of data collected by the Biometry Research Unit of the Institute. The correlates which have been identified for the MN blood groups are mean corpuscular hemoglobin and mean corpuscular hemoglobin concentration, with mean values for the MN (heterozygous) blood group being lower than mean values for MN (homozygous) and NN (homozygous) blood groups.

An entirely new formula for projecting yield in warm-water pond fish culture has been submitted to the FAO for use by the member countries. This formula makes use of the following data: initial number of fry stocked in a pond, the expected proportions surviving according to density and treatment, and the expected weight of any fish, chosen at random, according to treatment and age. This formula is the first to explicitly take postembryonic conditions into account in projecting yield and emphasizes the waste created by the neglect of fish at the postembryonic state.

#### 2. BOTANY

Investigations on crop mixtures were continued in the Institute's experimental farm at Giridih (Bihar) and in Hatikanda (West Bengal). The results further established the beneficial effects of certain mixtures observed in the previous years. Varietal mixtures of rice, wheat and species mixtures of wheat and gram, and pea are being studied.

The programme of selection of rice for desirable characters and also the work on the purification of paddy samples collected from different parts of India are in progress.

#### 3. CROP SCIENCE

It was already reported that coconut palms with left-handed foliar spiral produced on an average 20.9 per cent more nuts per tree per year than the right-handed ones as evidenced by data obtained from a plantation in Kerala.

Fresh data on the nut yield of coconuts obtained from Tanzania further confirm the earlier finding. The difference in a large block in Tanzania is as large as 24 per cent on the basis of data gathered over a six-year period.

It seems possible to visualize the effect of the one-way rotation of the earth on plants as well. Data received from several countries around the tropics on the foliar spiral of the coconut reveal that in the northern hemisphere there are more left-spiralled palms, and in the southern hemispheres the right-spiralled ones are in excess, and the hemispherical difference is statistically significant. An examination of a large number of twining plants in the northern hemisphere as far as 60°N reveal that over 80 per cent of these stem-twiners rotate against the apparent movement of the sun and the small percentage of the rest move with the sun. *Mikania scandens*, a stem-twiner of the sun-flower family has some of its shoots veering clockwise (left-handed) and the others counter-clockwise. An examination of plants at a few centres from 6°N (South Ceylon) to 26°N (Or-chhat) revealed that the percentage of left-spiralled shoots steadily increase from 54 per cent to 71 per cent.

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### 4. DEMOGRAPHY

*Estimation of birth and death rates* : The determination of the birth and death rates is a matter of considerable importance. The official figures for the decade 1941-50 for all-India and also for the States seem to be somewhat controversial. The birth and death rates for all-India and West Bengal have, therefore, been re-estimated by the application of some other techniques and have been found to be of the order of 42.5 and 31.0 per thousand population per annum respectively for West Bengal which are in excess of official figures.

*A biostatistical model on the spacing between births* : In connection with the construction of a biostatistical model on the spacing between births, the probability distributions relating to some of the components of spacing such as period of post-partum amenorrhoea, risk period and gestation period have been studied. The work is in progress.

### 5. EDUCATIONAL PSYCHOLOGY

A model of response to multiple choice items is formulated, which takes into account the gradation of various alternative responses and the possibility of guessing different alternatives with different chances depending upon the ability of the subject. The parameters involved in this model generalize the notion of limen, to multiple limina. This introduces the concept of marginal limina useful in items analysis. Simple graphical procedures are suggested for the estimation of the parameters involved, the limina and the proportions of the guesses.

Several years ago, Professor Mahalanobis suggested a method of simplifying the examination system by the construction of a universe of questions from which a question paper needed for any examination could be automatically set by a random selection. This is easily done with the help of a computer in which the 'universe' can be stored. Some experiments conducted in the Institute on these lines have been found very successful. Further investigations on the reliability of the system and its advantages have been made during the last year.

IPNS (interpenetrating net work of samples) introduced by Professor Mahalanobis has proved very useful in improving estimates of an examinee's true performance when the question papers are set by simple random sampling or stratified random sampling of universes of questions. In particular, it provides a confidence interval for the true score and permits estimation of the probabilities of being assigned to the first, second, and third classes. These developments represent an advance over classical psychometric theory, in which the error estimate is determined solely by the reliability of the examination and hence is the same for all examinees answering a given question paper. Classical psychometric theory lacks the statistical basis for making inferences from sample to universe, computing confidence intervals, and estimating classificatory probabilities, all of which are possible with IPNS.

### 6. EMBRYOLOGY

Actinomycin and chromomycin have become useful tools for investigating the fundamental problems of embryonic information transfer. It has already been shown how the information for the development of eye and onset of metamorphosis can be blocked in *Ciona*. A similar line of research has been undertaken on snail embryos. The results are being

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supplemented with ultra-violet irradiation (in collaboration with Dr. R. Poddar, Biophysics Department) which can also switch off the nuclear message. The results obtained suggest that information transfer mostly takes place in the trochophore stage.

RNA synthesis in snail is now being investigated with the radioisotope  $P^{32}$ . The findings add evidence at the molecular level. It is clear that there is a smoothly rising peak of nucleic acid metabolism, the major part of which is due to RNA, (as shown by NaOH digestion) starting before the first cell division and rising to its maximal level at the trochophore stage and then smoothly declining. By suppressing this incorporation with antibiotics and using the sucrose density gradient method, light is being thrown on the fundamental problems of genie transcription and translation. The Director, International Biophysics Institute, Naples, kindly made a gift of Beckmann-tubes.

### 7. GEOLOGICAL STUDIES

The integrated research programme of the Geological Studies Unit has been pursued during the year.

Special statistical tests for the analysis of circularly distributed, vectorial data of cross-bedding azimuths have been developed as a result of a cooperative study of the geologists and statisticians of the Research and Training School of the Indian Statistical Institute. These tests have been applied to the cross-bedding data collected from Kamthi formation around Bheemaram, Pranhita-Godavari Valley. The statistical analyses lead to the conclusion that the direction of sedimentation in the ancient Kamthi river significantly changed with time. This work is a part of a comprehensive study of Gondwana sedimentation around Bheemaram, which has now been completed.

The stratigraphy of the Coastal Gondwana and post-Gondwana rocks, West Godavari District, Andhra Pradesh, near Ellore (Eluru) with special reference to the Raghovapuram Mudstone has been completed. Depositional history and tectonics of these rocks have been evaluated. Many new occurrences of plant and invertebrate fossils have come to be known in this area. This detailed study, such as, palaeontology, sedimentology, cross-bedding analysis, vector-means-analysis of wood-fossil orientation, etc. of these rocks lead to visualise the recurrent fluctuations of the sea-level of the Coromandel Coast since the geological past.

General morphology and systematic description of the Indian Rhynchosaur have been worked out which allow the complete restoration of a Maleri fauna for the first time. As a result of this study, the evolution of Rhynchosaurs in space and time has been suggested. The Yerrapalli formation—a new formation which was established by the unit in the Bheemaram area and reported in 1964 has been established in the main Maleri field.

New faunal and lithological evidences which have been found provide a better understanding of the stratigraphy of the Maleri and Kota formations. The Kota-Maleri boundary can be now clearly defined. Further collections on the newly discovered Maleri dinosaur have been made. This dinosaur provides a key to the stratigraphy of the Maleri formation. Two faunal associations have been found in the Maleri formation throwing light on the palaeoecology.

Evidence on the presence of life in the form of Stromatolites has been noticed for the first time in the Pre-Cambrian (>600 million years old) rocks of the Ramagundama area.

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About 350 sq. miles of the Pre-Cambrian sedimentaries have been mapped in detail. Petrography and sedimentary structures which have been studied in detail would help in the reconstruction of the paleogeography of the area.

#### 8. SOCIOLOGY

The Sociological Research Unit completed two projects in 1966. The first project, "Studies in the Sociology of Education", was sponsored by the National Council of Education Research and Training and the Education Commission, Ministry of Education, Government of India. The second project was a study in levels of integration and social effects of industrialization and urbanization in 2,000 villages within a radial distance of 20 miles from the town of Giridih in Hazaribagh district, Bihar.

Another project was undertaken for assessing the nature of quantification and/or statistical designing of research in sociological and social anthropological works in India. The study has covered the libraries of the Indian Statistical Institute, National Library, Anthropological Survey of India, and Cultural Research Institute of the Government of West Bengal. Other important libraries of the State will be covered in the future.

#### IX. DOCUMENTATION RESEARCH AND TRAINING

*Techniques of teaching library science* : The training of persons in advanced methods of documentation was continued. The application of different teaching techniques to the teaching of the subjects in library science was experimented upon and published in the form of reports on the actual class-room discussion in the D.R.T.C. With a view to provide guidance to the schools of library science in the country for the proper training of students of the B.Lib. So. Course, a series of papers on the different teaching techniques was published.

*Organisation of libraries* : A plan for the organization of academic libraries in the Fourth and subsequent Five-Year Plan Periods has been drawn up and published as a special issue of the *Library science with a slant to documentation*.

*Classification* : The postulates and principles of classification were critically examined in the light of the research done in the subject during the last decade. The results were embodied in the third edition of the *Prolegomena to library classification*, now in the press.

*Cataloguing* : A critical comparative study of the Classified Catalogue Code of India and the new Catalogue Code of the United States has been initiated. The book, *Practical cataloguing*, is being revised to bring it in conformity with the rules of the new edition of the *Classified catalogue code*.

*Technique of writing* : A set of guiding principles for writing books and articles in learned periodicals, based on the principles for classification, was formulated. The principles were embodied in a standard drawn up for the Indian Standards Institution.

#### X. COMPUTER SCIENCE

*Numerical analysis* : Certain digit-by-digit methods resembling repeated-subtraction division, (may be called pseudo-division) were worked out for the evaluation of elementary functions like square-root, Logarithm and Arctan. These schemes are suitable for both soft-ware realizations, particularly, in character-oriented machines.

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*Computer arithmetic* : Studies have been carried out on the theory of segmented division. In particular, the effects of various types of rounding in the choice of segmented divisor have been considered. These studies have given rise to simple and powerful techniques for division operation in digital computers both from the point of view of hard-ware and soft-ware.

The higher order segmented divisions, in particular, will have interesting applications in desk calculators as they are more powerful and the accuracy is more exactly defined than the conventional linear interpolation and binomial theorem methods.

*Construction of codes* : Certain class of codes were constructed for checking errors in arithmetic operations in digital computers.

*Computer logic* : Some properties and characterizations of switching functions by their threshold order are presented. The applicability of the Ho-Kashyap algorithm for testing and realization of a threshold function of order  $r$  is established. A comparison of these methods of realizing a switching function is made to Kaserman's procedure of determining a non-linear realization of switching function. Tables of three-input switching functions classified by their threshold order and their parameters are presented.

## PLANNING DIVISION

### A. WORK IN DELHI

*Inter-Industry studies* : The inter-industry studies were continued during the period. An input-output table consisting of 77 sectors was prepared for the year 1964-65. A consistency model was applied to project levels of output to be achieved in different sectors by 1970-71 and 1975-76, in order to relate specific targets of income, investment and consumption. These have been incorporated in the publication *Draft Fourth Plan, Material and Financial Balances*, Perspective Planning Division, Planning Commission.

*Growth of crop agriculture* : The research work on the growth of crop agriculture has been focussed on the following issues :

1. Crop output growth during 1951-52 to 1964-65 has been split up into different component elements.
2. The relationship between productivity per gross acre and various inputs (irrigation, fertilisers, labour and draft power) has been estimated on a cross-section basis.
3. Experimental evidence on dwarf wheats has been analysed and the response of these wheats to fertilisers was estimated.
4. In order to study the question of risks in fertiliser use, experimental evidence on wheat (during the decade of the nineteen fifties) from a few experimental stations of North India has been analysed. The functional dependence between the variability of response and levels of nutrient application over time has been explored.
5. A good deal of exploratory work has been carried out on the relationship between prices and crop acreages (particularly of rice, wheat and cotton).

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*Import substitution* : A study on *A Programming Model for Import Substitution in India* (I.S.I. Discussion Paper No. 21) was completed. Work is in progress on the import content of production in Indian industries, using input-output techniques.

*Regional variations of cropping pattern* : As a part of the study on regional variations of cropping pattern, crop-association regions have been delineated. Core and peripheral areas of major crop-association have been identified. The analysis of the results is now in progress.

*Regional industrial patterns* : Studies on regional industrial patterns are in progress. A preliminary report, *Cement Industry—A case study in National and Regional Perspective—1976*, was prepared and discussed. Similar regional-locational possibilities are being analysed on the basis of reserves of important mineral resources in different areas and the industrial complexes that could be developed around them.

Differential regional patterns of consumption of certain commodities for four macro-regions of India were analysed and regional demand projections were made for 1970-71 and 1975-76. Studies are in progress in this direction for the Indian States.

Analysis is in progress on studies in regional development. A composite index of development has been constructed out of seventeen characteristics to identify the variations in levels of development by the districts of India.

*Growth targets for Fourth Plan period* : An attempt was made to build up consistent growth targets for the Fourth Plan period, with particular reference to the trade flows between West Bengal and the rest of India under the hypothesis of Leontief gravity relations. Further cross-section analysis based on regression methods was carried out to study inter-regional flows, allowing for substitution possibilities between regions. A number of maps were drawn to illustrate regional/locational aspects of the national economy.

*Pricing problems in a planned economy* : A preliminary study was completed on, *Pricing Problems in a Planned Economy* (I.S.I. Discussion Paper No. 18). The study attempts to analyse the non-monetary and monetary causes of price change and discusses the effect of changes in indirect taxes, profits and the supply of money on prices.

*Devaluation of the rupee* : An attempt has been made to work out the economic consequences of the devaluation of the rupee and the various export incentive schemes.

*Manufacturers' inventories* : A comprehensive study of manufacturers' inventories is in progress. Since the published data are inadequate for any detailed analysis in this field, two questionnaires were prepared to obtain information from the selected manufacturing companies.

*Material and financial balances* : The patterns of final demand which were projected for 1964-65, 1970-71 and 1975-76 have been incorporated as an Appendix to the Perspective Planning Division's study : *Material and Financial Balances*.

*Inter-State wage differences* : Work is in progress on inter-State wage differences. The question is being examined for some selected industries for the period 1957-1962.

*Manpower and educational development* : The joint research group, comprising members of the Indian Statistical Institute (Planning Unit, New Delhi) and the London

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School of Economics (Unit for Economic and Statistical Studies on Higher Education), in collaboration with the Perspective Planning Division of the Planning Commission, completed the first phase of its work in January, 1966, by producing, for the use of the Education Commission, a memorandum entitled, *Manpower and Educational Development in India (1961-1986)*.

The aim of the second phase of this research project, which began in January 1966 and will continue throughout 1967, is to produce a revised forecast of manpower and educational requirement in India, based on the results of empirical studies in manufacturing and other key sectors of the economy. During 1966, field studies were made to establish the influence of technological change, scale of plant, and the degree of utilization of installed capacity, on past and future manpower requirements in the nitrogenous fertilizer and heavy electrical engineering industries. In each sector, occupational and educational data (with related technical and economic data) were collected for about 7,000 individual employees. This information is now being processed, and related to the future development of the industries concerned. A final report on this study is expected to be brought out in the first quarter of 1968.

Revised forecasts of manpower and educational requirements are also being made for all other sectors of the economy, as well as in manufacturing, with particular emphasis on manpower and educational requirements in agriculture.

*Econometric studies* : A number of important econometric studies were completed during the period under review. One of the studies related to the economies of scale in consumption for selected items of household expenditure. A study was also made on the applicability of Stone's linear expenditure models to Indian data. A simple econometric model was constructed to study the role of retained earnings in determining stock prices in India. All these studies were presented at the Sixth Indian Econometric Conference in Calcutta.

*Translations* : Several articles dealing with planning and development techniques were translated into English from Russian and French.

### B. WORK IN CALCUTTA

The work in the Planning Division, Calcutta, included research, teaching, seminars and discussions and other activities. Research was mainly confined to national income and allied topics, consumer behaviour, macro-economic programming, econometrics and miscellaneous other subjects. A brief summary of research is given below :

I. *Studies on National Income and Allied Topics* : On the basis of a critical analysis of existing official national income statistics and other allied material, the conclusion was drawn that the official national income estimates at current prices were probably more in error than the corresponding estimates in real terms. Obviously, the deflation procedure applied was not satisfactory, but its inaccuracy helped in securing better estimates of the real net product. Naturally, the estimates at current prices needed improvement, so that the volume and price components of national product could become consistent and the latter could bear a reasonable relation with other available price index numbers in the country. In a second paper, the rapporteur's report at the fifth session of the Indian Association for



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Research in National Income and Wealth, these points were again stressed and it was suggested, among other things, that the deflation of national accounts should wait until a regular series of national accounts at current prices was available.

Work on the historical growth of the national product in India was continued and a critical appraisal was made of a series worked out earlier. It was found that the pattern of development indicated by the estimates was consistent with our general notions about the economic development of the country during the last century (P 124).

An attempt was made, for the first time in India to work out the shares of labour, capital and other factors in the post-independence economic growth of India following the approach developed by Abramovitz, Denison and others (S 91, S 99).

Two papers were devoted to the problems of non-monetary transactions in India. In one, the Indian condition was described and some estimates of expenditure elasticities were computed separately for monetized and non-monetized transactions (P 125). The theoretical lay-out of the model was more fully developed in the second paper, and certain relations between elasticities of different types were obtained (S 89). Further, the estimates of different types of elasticities were worked out on the basis of NSS data. This line of research is likely to be useful for many developing countries in which non-monetary transactions are sizable, because the use of conventional consumer behaviour models appears to be risky in these situations.

In a purely econometric exercise, a Cobb-Douglas type of production function was fitted to NSS data on household manufacturing enterprises. The elasticities of labour and capital as well as their errors came out to be of reasonable orders, indicating that Cobb-Douglas production functions could probably be used for household enterprises as a first approximation (S 88).

A relation was established between the stock, outturn and attrition rate of technical manpower, and this relation was used to test the Indian data. It was found, however, that the available estimates of stock in certain categories were not consistent with the past data on outturn taken together with a reasonable rate of attrition (P 126).

In a paper submitted to the Fourth Session of the Indian Econometric Conference, a review was made of the available Indian studies on the construction and use of inter-industry transactions tables in India. Some suggestions were made about the desirable lines of development, pointing out the importance of construction of basic inter-industry transaction tables at the national level, periodically (S 87).

An attempt was made, in a paper, to use both direct and indirect evidences on size distribution of personal income and consumption expenditure in India in order to ascertain whether the disparity as a whole in India had increased or not, during the post-independence period. It was found that the disparity of personal income by size increased sizably when reckoned in real terms. The evidence, however, was not conclusive when current price figures were taken (S 81, S 90).

An investigation into the contribution to national income from small industrial enterprises suggest an upward revision of the conventional estimate for 1965-56 by about 7 per cent instead of a downward revision by 15 per cent as done by the Central Statistical

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Organisation for the revised series. The long-term trend of capital formation in India during 1900-01 to 1950-51 was analysed in another paper, mainly on the basis of import data, and a pilot study was made on household saving behaviour (S 98). A series of population estimates of India from 1761 to the pre-census year 1872 was built up at decennial points, mainly on the basis of past gazetteers, historical evidence, geographical and statistical accounts, etc. A bibliography of national income and allied topics for India compiled earlier for the year 1947 to 1963, covering the important Indian journals and periodicals, was extended to 1964.

II. *Studies on consumer behaviour*: The linear expenditure system was applied in a paper to some time-series data on consumer behaviour in India. The purpose was to re-examine some startling estimates of Engel elasticities found by Pushpam Paul and Aahok Rudra (*Economic Weekly*, 28 November 1964) in an earlier application of the same system. The calculations were done in a more searching and extensive manner. It was found that owing to the limitations of data, the estimates have very wide margins of errors; but the most plausible "point" estimates are closer to the usually accepted cross-section estimates than the Paul-Rudra note would seem to show. Some general observations were made in this connexion on the difficulties of the time-series approach to demand analysis in India, and emphasis was laid on the need of refining the current estimates of cross-section elasticities.

The work on estimation of Engel elasticities from NSS budgets was continued from previous years. In particular, use was made of the budgets collected in the middle-class family living surveys carried out in 1958-59 in different centres of India. An important advantage of such data is that relatively homogeneous social groups are covered in each centre-wise sample. In one study, Engel elasticities were estimated by usual methods for 39 commodity groups for each of ten selected urban centres. An interesting feature of the study was that four algebraic forms of Engel curve were tried for each commodity group and the form giving the best fit was used for estimating elasticities at different income levels.

A case study was made on the seasonal variations in rural consumption. The tabulation part of the work has been completed and some interesting results are expected from the analysis. In a paper on regional disparities in household consumption in India, an analysis was made of the distribution of persons by per capita household consumer expenditure on all items estimated from the Thirteenth Round (September 1957-May 1958) of the National Sample Survey, separately for rural and urban sectors of the States in India. For rural India, urban India and all-India, the disparities in consumption are analysed into between States and within States components. This is easily done by an analysis of variance of logarithms. Greater attention is given to measures related to the Gini-Lorenz concentration curves but while the "between States" concentration curve could be defined in an interesting manner, the "within States" component could not be defined with equal success.

III. *Macro-economic programming and econometrics*: A programming model has been formulated in order to determine the optimum allocation of land under different crops. The preference function used in this model maximizes total export of the economy subject to some restrictions on consumption, investment, input, total land available for cultivation etc. It is emphasized that partial equilibrium analysis is inadequate for determining the optimum crop pattern and the interdependence between the different sectors of the economy should be specifically taken into account. Another item of work taken up relates to the formulation of linear programming model which will determine the optimum crop rotation plan for a farmer having a fixed area of land and a given fund.

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A large-scale sampling experiment was started for investigating the sampling distributions arising in Fraetile Graphical Analysis with particular emphasis on the robustness of the distributions and the power of the test criteria proposed by Professor P. C. Mahalanobis.

#### IV. MISCELLANEOUS STUDIES

*The choice of technique in agricultural implements industry* : This is a type study covering units of the industry in West Bengal and is in continuation of an earlier study in the choice of techniques in the mustard oil industry. Some interesting results emerged from the analysis. For example, from the long-range point of view, in this industry, for expansion of both employment and output, the most capital intensive techniques should be preferred ; while from the short-range point of view, for expansion of employment and output, units with the lowest capital intensity should be preferred.

*Population trends of India's cattle and buffaloes and India's animal efficiency for crop production* : The chief characteristics in the population trends of India's cattle and buffaloes were analysed in one paper, while in another, the work efficiency of the animals in relation to land, climate, and cropping pattern etc., was investigated and the outlook of mechanized agriculture examined.

*Economics of coal mining operation in India* : The paper is based on data collected by the Sample Survey of Manufacturing Industries on coal mining activities for the years 1956-58. The economics of scales of operation of coal mining activities has been examined with the help of some indicators. It has also been investigated if there is any correlation between the age of collieries and economics of operation. The study includes concentration of capital, output, labour etc., in respect of the coal mines.

*Distribution of public expenditure on health and education in West Bengal* : This paper, which is now complete, tries to ascertain the nature of the distribution of public expenditure on health and education in West Bengal. The analysis furnishes supplementary information on the real inequality of income distribution.

#### V. FIELD SURVEY

The Planning Division maintains a small Field Unit mainly for methodological enquiries. The unit completed the following survey during the year under review.

*Survey on employment and attitude to registration in Calcutta* : In this survey, information was collected on the employment pattern and particulars of registration of live registrants in the employment exchange in Calcutta. The operation covered the entire municipal area of Calcutta and a portion of the 24 Parganas. Out of two lakhs of live registrants in the register, two independent samples of 900 live registrants were systematically selected. The field work for the collection of information by directly interviewing the respondent was started in December 1965. The analytical part of the work is in progress.

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### NATIONAL SAMPLE SURVEY

*Developmental studies :* The following studies were taken up as research projects during the year : 1. A type study on human heights and weights were conducted in 84 selected villages in West Bengal in June 1966 ; 2. An integrated scheme of studies of land-utilisation surveys through interviews of selected households and direct plot-to-plot observation of height and weight measurements of all the members of the sampled households, their marketing preferences etc., was taken up during February-May 1967 in 216 villages of West Bengal. Of these, 168 villages were in South Bengal and the remaining 48 in North Bengal.

*Sample design :* Some studies relating to the improvement of the sample design were undertaken. The technical paper on the sampling design of the nineteenth round of the NSS was completed and submitted to the Central Statistical Organisation as a NSS Draft Report (No. 143).

*Other Studies :* Deb Kumar Dutta Mazumder has been working on Engel curve analysis and his findings are as follows :

1. As a choice of regressors in the Engel curve analysis, a theoretical model was established for the interpretation of regression coefficients estimated from three different combinations of classificatory variables and regressors and it was found that ranking of commodities by elasticity coefficients and 'total expenditure elasticities', as weighted average of constituent commodities from the three combinations were not significantly different.

2. He studied the relative merits of estimating Engel elasticities from a specific concentration curve, after the verification of the assumptions about the income distribution and the form of Engel curve involved over the conventional weighted and unweighted least squares. With an assumption about the constant elasticity and absolute invariance of the Engel curve, certain formulas for demands projection were derived, where after estimating the parameters in the formula, the projected demand of cereals during the Fourth and Fifth Five Year Plans were obtained.

3. He examined, along with M. L. Ganguli, the goodness of fit of the Engel curve form for a large number of consumer items for a number of middle class family living survey centres and the elasticities were utilised for grouping the commodities as 'essential' and 'non-essential' with the corresponding proportion of expenditure in family budgets.

4. The problem of post-stratification after sample selection was examined by suggesting four different estimators and empirical results obtained.

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**Annexure 1 : List of Office-bearers and Members of the Council, Governing Body and Members of the Committees of the Council and Governing Body.**

*President :* Shri Y. B. Chavan, Home Minister, Government of India.

*Honorary Vice-President :* Dr. C. D. Deshmukh, D.Sc. (*former President*)

*Vice-Presidents :* 1. Professor S. N. Bose, F.R.S., D.Sc., F.N.I., National Professor  
2. Professor D. N. Wadia, M.A., D.Sc., F.G.S., F.R.G.S., F.N.I., F.R.S., National Professor,  
3. Professor D. R. Gadgil, M.A., M.Litt., 4. Dr. S. R. Ranganathan, M.A., D.Litt., F.L.A.,  
National Professor, 5. Shri Asoka Mehta, Planning Minister, Government of India, 6. Shri  
Vishnu Sahay, Governor of Assam and NEFA, 7. Shri P. C. Sen.

THE COUNCIL: 1966-67

*Chairman :* Shri K. P. S. Menon, I.C.S. (*Retd.*)

*Vice-Chairmen :* 1. Shri S. Dutta, I.C.S. (*Retd.*), Vigilance Commissioner, West Bengal, 2. Shri B. B. Ghosh, M.Sc., Chairman, Commissioners for the Port of Calcutta, 3. Shri S. C. Ray, M.A., B.L.

*Additional Vice-Chairmen :* 1. Professor Samuel Mathai (Kerala Branch), 2. Professor M. Narayana Iyengar (Mysore State Branch), 3. Shri S. K. Wankhede (Bombay Branch).

*Treasurer :* Dr. S. C. Law, M.A., B.L., Ph.D., F.Z.S., M.B.O.U., F.N.I.

*Secretary :* Professor P. C. Mahalanobis, F.R.S., D.Sc., F.N.I.

*Joint Secretaries :* 1. Shri S. Basu, M.Sc., F.N.I., 2. Shri N. C. Chakravarti, M.A., 3. Shri Pitambar Pant, M.Sc., 4. Shri Partha Roy, W.B.C.S.

*Members of the Council :* 1. Shri S. K. Acharyya, Bar-at-Law, 2. Dr. B. P. Adhikari, M.Sc. (Cal), D. res So. (Paris), 3. Shri R. Banerjee, I.A.S., 4. Dr. U. P. Basu, D.Sc., F.N.I., 5. Shri K. T. Chandoy, L.L.M. (Lond.), Bar-at-Law, 6. Dr. N. Das, Ph.D. (Lond.), I.C.S. (*Retd.*), 7. Dr. Dhabatosh Dutta, M.A., Ph.D., 8. Professor H. C. Ghosh, M.A., P.R.S., 9. Shri D. B. Lahiri, M.Sc., F.N.I., 10. Dr. P. S. Lokanathan, D.Sc., 11. Shrimati Nirmalkumari Mahalanobis, 12. Dr. N. T. Mathew, M.A., M.Sc., Ph.D., 13. Dr. B. S. Minhas, M.A., Ph.D., 14. Dr. I. G. Patel, B.A., (Cantab.), Ph.D. (Cantab.), 15. Dr. C. R. Rao, M.A., M.Sc., Ph.D., So.D. (Cantab.), F.N.I., F.R.S., 16. Dr. Amartya Sen, M.A., Ph.D., (Cantab.), 17. Shri Satis Chandra Sen, M.A., LL.B., 18. Dr. B. R. Seshachar, D.Sc., F.N.I., 19. Shri Jagjit Singh, M.A., F.R.S.S., 20. Shri Srinagabhushana, B.Sc., C.T.T., F.T.I., E.T.A.

*Government Nominees on the Council :* 1. Cabinet Secretary (Shri D. S. Joshi) or his representative, 2. Joint Secretary, F. & A, Ministry of Finance (Shri F. H. Vallibhoj), 3. Director, Central Statistical Organisation and ex-officio Joint Secretary, Department of Statistics (Dr. K. R. Nair).

*Coopted Members :* Dr. D. K. Bose, 2. Professor V. B. Kamath, B.Sc. (Lond.)<sup>1</sup> F.S.S. (Lond), 3. Dr. N. S. R. Santry, M.A., M.Sc., Ph.D.

*Ex-Officio Members :* 1. Dr. (Miss) A. George (Kerala Branch), 2. Professor Srinagabhushana (Mysore State Branch), 3. Shri K. A. Antony (Bombay Branch).

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### GOVERNING BODY OF THE RESEARCH AND TRAINING SCHOOL: 1966-67

1. Shri K. P. S. Menon, Chairman (*ex-officio*), 2. Professor P. C. Mahalanobis, Honorary Secretary (*ex-officio*), 3. Dr. C. R. Rao, Director, RTS (*ex-officio*), 4. Shri Dinesh Bahl, Managing Director, Capital (Private) Ltd., (*Associated Chambers of Commerce of India*), 5. Dr. S. N. Sen, M.A., Ph.D., Head of the Department of Economics, Calcutta University, (*Indian Economics Association*), 6. Shri B. K. Dutta, Managing Director, United Bank of India Ltd., (*Federation of Indian Chambers of Commerce and Industry*), 7. Joint Director (Dr. K. S. Rao), Central Statistical Organisation, (*Government of India*), 8. Joint Secretary (Shri F. H. Vallibhoy), Ministry of Finance (Financial Adviser to the Cabinet Secretariat), Department of Expenditure, (*Government of India*), 9. Professor S. S. Shrikhande, F.N.I. Professor of Mathematics, Bombay University, (*National Institute of Sciences of India*), 10. Dr. N. S. R. Sastry, M.A., M.Sc., Ph.D., Director of Statistics, Department of Research and Statistics, Reserve Bank of India, (*Reserve Bank of India*), 11. Shri D. C. Pavate, M.A. (Cantab.), Vice-Chancellor, Karnatak University, (*Inter-University Board*), and 12. Professor S. N. Bose, F.R.S., 13. Dr. B. R. Seehachar, D.Sc., F.N.I., Dean, Faculty of Science, University of Delhi, 14. Shri Jagjit Singh, M.A., F.R.S.S., Director, Railway Board, 15. Dr. B. P. Adhikari, M.Sc. (Cal.) Dr. sc., So. (Paris), 16. Shri Partha Roy, W.B.C.S., 17. Shri S. Basu, M.Sc., F.N.I., 18. Shri Pitambar Pant, M.Sc., (*Council of the Indian Statistical Institute*).

### FINANCE COMMITTEE OF THE COUNCIL

1. Chairman of the Institute (*ex-officio*) or his nominee, 2. Secretary of the Institute (*ex-officio*) or his nominee, 3. Director of the Research and Training School (*ex-officio*) or his nominee, 4. Dr. D. K. Bose, 5. Shri K. T. Chandy, 6. Dr. N. Das, 7. Shri S. Dutt, 8. Shri Pitambar Pant, 9. Shri Partha Roy (*Member-Secretary*) or in his absence a person nominated by the Secretary or the Chairman (or the Vice-Chairman authorised by the Chairman to make such nomination), 10. & 11. two representatives nominated by the Government of India, (Joint Secretary, Ministry of Finance, Shri F. H. Vallibhoy and Cabinet Secretary, Shri D. S. Joshi or his representative).

### FINANCE COMMITTEE OF THE GOVERNING BODY

1. Chairman of the Institute (*ex-officio*) or a Vice-Chairman, authorised by him, 2. Secretary of the Institute (*ex-officio*) or in his absence, a Joint Secretary, 3. Director, RTS or a Joint-Director, if any, in charge of the RTS, 4. & 5. Two representatives of the Government of India (Dr. K. S. Rao and Shri F. H. Vallibhoy), 6. Representative of the Reserve Bank of India on the Governing Body (at present Dr. N.S.R. Sastry), 7. & 8. Two representatives to be elected by the Governing Body from amongst themselves, (Dr. B. R. Seehachar and Dr. B. P. Adhikari.)

### JOURNAL COMMITTEE OF THE INSTITUTE

1. Professor S. N. Bose, F.R.S., National Professor, Chairman, 2. Shri D. B. Lahiri, 3. Dr. Sujit Kumar Mitra, 4. Dr. Jogabrata Roy, 5. & 6. Editors of *Sankhyā*, (*ex-officio*), 7. One representative of the Governing Body of the Research and Training School (Dr. V. S.

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Huzurbazar), 8. One member to be nominated by the Secretary of the Institute in consultation with the Director of the BTS., 9. Dr. J. Sothuraman, *Editorial Secretary*, 10. Shri A. Mahalanobis, *Secretary*.

EXAMINATIONS COMMITTEE OF THE INSTITUTE

1. Dr. B. P. Adhikari, 2. Dr. K. S. Banerjee, 3. Shri Debebrata Basu, F.I.A., 4. Dr. P. K. Bose, 5. Shri N. C. Chakravarti, 6. Dr. (Miss) A. George, 7. Dr. V. S. Huzurbazar, 8. Professor V. B. Kamath, 9. Professor D. B. Lahiri, 10. Dr. B. S. Mithas 11. Dr. S. K. Mitra, 12. Professor M. Mukherjee, 13. Dr. M. N. Murthy, 14. Professor P. N. Phutane, 15. Dr. B. Ramchandran, 16, & 17. Two representatives of the Governing Body of the Research and Training School (Dr. K. S. Rao, and Dr. S. N. Sen.), 18. Shri J. M. Sengupta, 19. Dr. G. R. Seth, 20. Shri S. Sengupta, *Member-Secretary*.

BOMBAY BRANCH: 1966-67

*Honorary President* : Shri S. K. Wankhede

*Honorary Vice-Presidents* : 1. Professor C. N. Vakil, 2. Shri R. G. Saraiya, 3. Dr. N. S. R. Sastry, 4. Dr. C. Nanjundayya.

*Honorary Secretary* : Shri K. A. Antony

*Honorary Joint Secretary* : Shri P. K. Bhowmik

*Honorary Treasurer* : Professor P. N. Phutane

*Members of the Council* : 1. Dr. R. L. N. Iyengar, 2. Professor V. B. Kamath, 3. Shri S. V. Bockar, 4. Professor N. S. Ramaaswamy, 5. Dr. M. N. Vartak.

MYSORE STATE BRANCH: 1966-67

*President* : Professor M. Narayana Iyengar

*Vice-President* : Shri H. C. Ramanna

*Secretary* : Professor Srinagabhanna

*Joint Secretary* : Shri C. Ananthapadmanabha Setty

*Treasurer* : Shri M. V. Venkataraman

*Executive Committee Members* : 1. Shri H. S. Narayana Rao, 2. Professor R. Natarajan, 3. Dr. M. V. Jambunathan, 4. Shri P. S. Narayana, 5. Shri V. Narayana, 6. Shri Ravi L. Kirloakar.

KERALA BRANCH: 1966-67

*Chairman* : Professor Samuel Mathai, Vice-Chancellor, University of Kerala.

*Secretary and Treasurer* : Dr. (Miss) A. George, Professor of Statistics, University of Kerala.

*Members* : 1. Professor S. Janardhana Iyer, Professor of Statistics, Government Victoria College, Palghat, 2. Dr. R. Krishna Pillai, Reader in Statistics, University of Kerala, 3. Shri R. Ramkumar, Lecturer, Department of Statistics, University of Kerala.

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### Annexure 2. Important Items of Business Transacted in Meetings of the Council and Governing Body, Research and Training School.

#### 2.1. MEETINGS OF THE COUNCIL

1. 16 May 1966: (1) Auditors' report, balance sheets and audited statements of accounts of 1964-65; (2) budget estimates for current expenditure of 1966-67; (3) estimates of plan expenditure and capital expenditure for 1966-67; (4) receipts estimates for 1966-67; (5) report of the Statutory Committee for 1965-66; (6) interim recommendations of the Statutory Committee for 1966-67; (7) arrangements for UNTAA sector; (8) estimates for Electronic Data Processing and Computation Unit (EDPCU) for 1965 and 1966-67; (9) installation of teleprinter between Calcutta and Delhi; (10) banking accounts at Kerala and Bangalore; (11) payment of gratuity to retiring employees; (12) payment of dearness allowance; (13) procedure for furnishing completion certificates for construction; (14) report from Governing Body regarding prospectus of the Research and Training School; (15) possession of land in Bangalore; (16) resignation of Shri Bhaskar Mittar, Member of the Council.

2. 27 July 1966: (1) Amendment of Rule 25 of the Indian Statistical Institute General Provident Fund (ISIGPF); (2) all India Professional examinations in statistics; (3) banking arrangement in Madras; (4) filling up of vacancy in the Council—Shri P. Roy, Administrative Officer, elected member of the Council in place of Shri Bhaskar Mittar (resigned); (5) matters relating to the UNTAA (including Development) Workshop; (6) financial arrangement for 1966-67; (7) medical assistance for workers for 1964-65; (8) categorisation of workers; (9) arrangement regarding National Sample Survey Department; (10) release of Shri M. S. Bhatnagar, Financial Adviser, from 1 August 1966 and the appointment of a substitute; 11. banking overdraft arrangement.

3. 29 August 1966: (1) Reference to death on 10 August 1966 in Calcutta of Dr. Sudhangshu Kumar Banerjee, D.Sc., who was associated with the Institute for many years as a member of the Council and of the Governing Body of the Research and Training School and as Vice-Chairman, and Vice-President; (2) arrangements about National Sample Survey work—it was reported that Dr. D. K. Bose had been placed in overall charge of the NSS including the Operational Centres of Baranagar, Giridih and Delhi and the Design and Appraisal Section at headquarters. He was also appointed as Joint Secretary. Two Committees, (i) Technical Advisory Committee, (ii) Operations Consultative Committee to help in the work of the NSS; (3) matters relating to the UNTAA (including Development) Workshop; (4) nominations for the election of office-bearers and members of the Council.

4. 27 September 1966: (1) Nominations for the election of President and Vice Presidents; (2) co-optio of Dr. D. K. Bose, Joint Secretary and Head, NSS, as a member of the Council; (3) date for the Annual General Meeting fixed on 31 October 1966; (4) recommendations of the Governing Body of the Research and Training School were recorded in respect of (i) reconstitution of the Ph.D. Committee, (ii) results of B.Stat and M.Stat examinations, and (iii) award of the Ph.D. degree; (5) report on the recommendations of Statutory Committee for 1965-66 was considered item by item; (6) audit report and audited statements of accounts for 1964-65; (7) audit report and audited statements of accounts for 1965-66; (8) revised budget estimates for 1966-67; (9) provisional budget estimate for 1967-68; (10) matters relating to the UNTAA sector; (11) revised (1966-67) and provisional (1967-68)



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budgets for EDPCU ; (12) co-optation of Professor V. B. Kamath, B.Sc. (Lond.), F.S.S. (Lond.) and Dr. N. S. R. Sastry, M.A., M.Sc., Ph.D., as members of the Council, (13) registration of Provident Fund.

5. 6 October 1966 : (1) Matters relating to the UNTAA sector.

6. 31 October 1966 : (1) Draft Annual Report for 1965-66 ; (2) election of auditors for 1966-67 ; (3) recommendations to Annual General Meeting for the election of Shri S. Banu, Shri N. C. Chakravarti and Shri P. Roy as Joint Secretaries in addition to Shri Pitambar Pant ; (4) consideration of extracts from the 68th Report of the Public Accounts Committee —1966-67 ; (5) amendment to proceedings of the Council dated 27 July 1966 in respect of the results of All India Professional Examinations in Statistics held in May 1966.

7. 14 January 1967 : (1) Reference to the death on 31 December 1966 at his residence in Calcutta of Sir D. N. Mitra who was Vice-President of the Institute in 1953-54, Vice-Chairman in 1954-55 and Chairman from 1955-56 to 1963-64 ; (2) a Committee consisting of Dr. C. D. Deshmukh (Chairman), Dr. B. B. Seshachar, Dr. C. R. Rao, Shri Pitambar Pant and Professor P. C. Mahalanobis (Convener) with powers to co-opt, to advise the Chairman and the Council on matters arising out of the report of the Review Committee ; (3) printing machineries from the USSR, matter to be finalised in consultation with Academy of Sciences, USSR ; (4) Professor V. B. Kamath, Dr. N. S. R. Sastry and Dr. D. K. Bose, co-opted members of the Council ; (5) appointment of Finance Committee ; (6) appointment of Journal Committee ; (7) appointment of Examinations Committee ; (8) nomination of Professor S. N. Bose, Dr. B. R. Seshachar and Shri Partha Ray as Council's representatives on the Governing Body of the Research and Training School ; (9) report from Governing Body of the Research and Training School regarding award of degrees and diplomas ; (10) award of Honorary Degree of Doctor of Science on Academician M. V. Keldykh ; (11) matters relating to the UNTAA sector ; (12) report regarding progress in respect of reconstitution of the Board of Trustees for the ISI General Provident Fund ; (13) operation of banking account

8. 23 March 1967 : (1) Reference to death on 11 March 1967 in Mountain Lakes, New Jersey, USA of Dr. W. A. Shewhart who developed the method of SQC which suggested a powerful tool for increasing productivity and is being increasingly used all over the world. He was awarded the honorary degree of Doctor of Science by the ISI in 1962. He visited India on four occasions as a guest of the Institute since 1947. The Institute accepted in 1965 the offer of Dr. Shewhart's library and scientific papers as a gift ; (2) felicitation to Dr. C. R. Rao on his being elected at the age of 46 a fellow of the Royal Society of London on 16 March 1967 ; (3) rates of interest to be paid to Provident Fund for 1966-67 and 1967-68 ; (4) final budget estimates for 1966-67 ; (5) estimates for 1967-68 ; (6) report from Governing Body on results of All-India Professional Examinations in Statistics ; (7) approval of award of M.Stat and Ph.D. degrees was recorded ; (8) authority for signing cash credit documents ; (9) recommendation from the Board of Management regarding budget estimates for 1967-68 was recorded ; (10) secretarial arrangement—Professor P. C. Mahalanobis and Shri Pitambar Pant agreed to continue respectively as Secretary and Joint Secretary for the present ; (11) categorisation ; (12) payment of children's education assistance allowance and leave-travel concessions to staff ; (13) subscription rates for members of the Institute who reside outside India.

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### 2.2. MEETINGS OF THE GOVERNING BODY, RESEARCH AND TRAINING SCHOOL

1. 16 May 1966 : Item Nos. (1), (2), (3), (4), (5) and (6) of the Council Meeting of the same date.
2. 27 September 1966 : (1) Reconstitution of Ph.D. Committee of Research and Training School ; (2) approval of (i) results of B.Stat and M. Stat examinations for 1966 ; (ii) recommendation for conferment of Ph.D. degree and item Nos. (6), (7), (8), (9) and (13) of the Council meeting of the same date.
3. 31 October 1966 : Item Nos. (1), (2), (4) and (5) of the Council meeting of the same date.
4. 14 January 1967 : (1) Recommendation for award of honorary degree of Doctor of Science of the Indian Statistical Institute on Academician M. V. Kaldyah, President, Academy of Sciences, USSR ; (2) award of M.Stat degrees and diploma in SQC and allied techniques ; (3) approval of prospectus of the Research and Training School for the session 1967-68 and for opening of an evening course in Bangalore by the RTS ; (4) Dr. K. S. Rao and Dr. S. N. Sen renominated as representatives on the Examinations Committee ; (5) Dr. V. S. Huzurbazar nominated as representative on the Journal Committee ; (6) Dr. B. R. Sothachar and Dr. B. P. Adhikari nominated as representatives on Finance Committee of the Governing Body.
5. 23 March 1967 : Item Nos. (1), (2), (3), (4), (5), (6), (7), (11), (12) and (13) of the Council meeting of the same date.

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## Annexure 3 : Admission to Courses

## 3.1. RESEARCH AND TRAINING SCHOOL

sl. no.	courses	number		
		applied	appeared in selection tests	admitted
<i>I. Full-time Courses</i>				
1.	Research courses leading to registration for the Ph.D. degree	84	60	6
2.	Research Apprentice	13	—	10
3.	Research Project Assistant	1	—	1
4.	Research Scholar/Fellow	—	—	17
5.	M.Stat. 1st year	360	263	28
5.1	M.Stat. 2nd year (by promotion)	—	—	*36
6.	B.Stat. 1st year	178	126	13
6.1	B.Stat. 2nd year (by promotion)	—	—	6
6.2	B.Stat. 3rd year (by promotion)	—	—	15
6.3	B.Stat. 4th year (by promotion)	—	—	22
7.	Statistical Officers' Course (jointly with the Central Statistical Organisation, New Delhi)	—	—	18
8.	Courses on Automatic Data Processing Systems :			
8.1	Three-month course on Electronic Data Processing System for sponsored candidates	26	—	26
8.2	Nine-month Course on Data Processing System, September 1966-May 1967	56	39	10
9.	International Statistical Education Centre (selected by the International Statistical Institute)	—	—	35
10.	Specialized Course in Applied Statistics leading to Diplomas :			
10.1	Econometrics and Planning	11	7	4

\* Including 3 direct admissions (by thesis)

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sl. no.	courses	number		
		applied	appeared in selection tests	admitted
10.2	Demography	10	4	4
10.3	Statistical Quality Control	93	59	19
10.4	Computer Science	65	47	3
11.	Short-duration individual training for officers on deputation	—	—	3
Full-time Courses : Sub-total of admissions		—	—	278

*II. Part-time and Evening Courses*

1.	One-year Evening Course in Statistics, Calcutta, September 1966-March 1967	77	67	20
2.	One-year Computer Training Course, Part I, Calcutta, September 1966-March 1967	33	21	12
3.	One-year Computer Training Course, Part II, Calcutta, March 1967-September 1967	—	—	4
4.	One-year Evening Course in Statistics, Delhi (in collaboration with the Central Statistical Organisation) September 1966-August 1967	29	26	23
5.	One-year Evening Course in Statistics :			
5.1	Bombay : September 1966-August 1967	30	25	21
5.2	Hyderabad : September 1966-August 1967	112	12	12
5.3	Madras : September 1966-August 1967	17	17	13
5.4	Trivandrum : September 1966-August 1967	15	10	7
Part-time and Evening Courses : Sub-total of admissions				112
All Courses : Total admissions		—	—	388

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3.2. STATISTICAL QUALITY CONTROL UNITS

unit	general	no. of participants	in-plant and others	no. of participants	
(1)	(2)	(3)	(4)	(5)	
1. Bangalore	1. First course on Reliability Engineering, 20 July-2 August 1966.	80	1. In-plant course on SQC at Messrs. Azam Jahi Mills Ltd., 23 February-8 April 1966.	28	
	2. Advanced course on Reliability Engineering, 16-26 August 1966	90	2. In-plant course on SQC at Messrs. Mysore Paper Mills Ltd., 10 June-9 July 1966.	34	
	3. Repeat course on Reliability Engineering, 21 September-4 October 1966.	30	3. In-plant course on SQC at Messrs. Hylan Ltd., 29 August-5 November 1966.	15	
			4. In-plant course on SQC at Messrs. Bharat Electronics Ltd., 1 September-3 December 1966.	24	
				5. Top management programme at Messrs. Bharat Electronics Ltd., 8-17 September 1966.	25
				6. Top management programme at Messrs. Hyderabad Allwyn Metal Works Ltd., 12-17 December 1966.	22
				7. Special programme on SQC Reliability and Statistics for the staff of SQC Units, 23-28 January 1967.	18
				8. Top management programme at Messrs. Mysore Iron & Steel Ltd., 8-7 February 1967.	24
2. Bombay	1. Training course on SQC, 12 December-26 January 1967.	18	1. Training course on Industrial Experimentation for Management of Messrs. Hindustan Lever Ltd., 13-18 March 1967.	18	
	2. Training course on SQC for personnel in Ordnance factories, 2 January 1967-8 March 1967.	27			
3. Daroda	—		1. In-plant course at Messrs. Gujarat Fertilizers on Total Quality Control System for Productivity and Quality, 8-7 February 1967.	88	

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unit	general	no. of partici- pants	in-plant and others	no. of partici- pante	
(1)	(2)	(3)	(4)	(5)	
			2. Training course on Statistical Methods in Military Engineering for majors and captains at the E.M.E. School and Electrical and Mechanical Engineers' School, Indian Armed Forces, Barois, 19, 24, 25, 27 January and 2 February 1967.	14	
4. Calcutta	1. Review session of general training course on SQC. March 1966, 8-8 July 1966.	17	1. In-plant course for metallurgical apprentices, Metal and Steel Factory, Iyahore (in two batches) 14 October 1965-19 February 1967, 20 July-17 December 1966.	18	
			2. In-plant course for assistant foremen and chargemen, Metal and Steel Factory, Iyahore (in two batches) 28 March-22 June 1966 and 4 July-19 October 1966.	32	
	3. Introductory training course on SQC for private sector, 7-18 February 1967 and 27-29 March 1967.	9	3. In-plant course for foremen, assistant foremen, chargemen and supervisors in Gun and Shell Factory, Coaipore (in two batches) January-April 1966 and June-October 1966.	27	
			4. Training course on Advanced SQC Techniques for SQC and work study for staff members in Gun and Shell Factory, Coaipore, 6 June-9 September 1966.	6	
				5. Training course on collection and compilation of SQC data for viewers in Gun and Shell Factory, Coaipore (in two batches), September-October 1966.	30
				6. Appreciation course on SQC on behalf of the Calcutta Productivity Council, 18-22 July 1966	8
5. Coimbatore	1. General training course on BQC for sugar industries under the auspices of the Madras State Federation of Co-operative Sugar Factories, October-December 1966.	17	1. In-plant course in Mowra. Sree Visalakshi Mills, August 1966.	13	
			2. Training programme on BQC and Operations Research Methods for the textile mills at Salem (all members of the unit), September 1966.	14	

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unit	general	no. of participants	in-plant and others	no. of participants
(1)	(2)	(3)	(4)	(5)
6. Delhi	—		1. In-plant training course on SQC in Messrs. Escorte Ltd., for the inspection staff.	8
7. Madras	1. General training course on Total Quality Control 9 May-30 June 1966.	10	1. Mining Division, Neyveli Lignite Corporation, 18 April-28 May 1966.	64
	2. Training course on Operations Research, 13-25 June 1966.	9	2. T.I. Cycles, 3 April-16 May 1966.	18
	3. Training course on Data Processing and Presentation to Management, 17-21 October 1966.	15	3. Seshasayee Industries Ltd., 18-31 August 1966.	20
			4. Neyveli Ceramics and Refractories Ltd., 1-16 October 1966.	30
			5. Addison & Co. Tool Works, 16 January-13 February 1967.	26
			6. Foundry Engineering Services, March 1967.	20
			7. English Electric Co. Ltd., 19 February-31 March 1967.	31
8. Kerala	—		1. Training course on Work Sampling at Trivandrum, 12-16 December 1966 and 2-4 January 1967.	24
9. Training and Promotional Unit	1. Advanced 10 weeks' Course in SQC for the senior staff at Deputy Manager's level from the different Ordnance Factories (commenced from 1 February 1967).	20	1. Diploma Course in SQC, 1966-67.	32
	2. Special five weeks' course in SQC for the training of apprentices from the Ordnance Factories, 20 February 1967-26 March 1967.			
		26		66
		273		692

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**Annexure 4 : List of Candidates awarded Degrees, Diplomas and Certificates  
at the Fifth Annual Convocation, 17 March 1967.**

**I. DOCTOR OF PHILOSOPHY**

*(The subject of the thesis is mentioned after the name of each candidate)*

1. Nikhilesh Bhattacharya, M.Sc. (Statistics, Calcutta University) : *Some statistical studies on languages.*
2. Thogarrathi Venkata Hanurav, M.A. (Mathematics, Andhra University), 3-year ISI training : *Optimum sampling strategies and some related problems.*
3. Hikoji Katano (Keizaiakushi—M.A., Economics, Nagoya University, Japan) : *The structure of income distributions in the Indian economy for 1955-56.*
4. Uppaluri Siva Ramachandra Murty, M.A. (Statistics, Osmania University) : *Extremal graph theoretic problems with applications to communication networks.*
5. Appaswamy Ramanathan Padmanabhan, M.A. (Mathematics, Annamalai University) : *Probabilistic aspects of rings of operators.*
6. Thiruvengatachari Parthasarathy, M.Sc. (Statistics, Madras University) : *Minimax theorems and product solutions.*

**II. MASTER OF STATISTICS**

*M. Stat. by examination : 1964-66*

1. Pradip Kumar Bandyopadhyay, M.Sc. (Mathematics, Jadavpur).
2. Archana Banerjee, B.Stat. (ISI).
3. Profulla Kumar Basak, M.A. (Mathematics, Calcutta).
4. Asruta Basu, B.Stat. (ISI).
5. Dattatraya Subray Dhat, B.Stat. (ISI).
6. Parthasarathi Bhattacharjee, B.Stat. (ISI).
7. Kunnathur Padinjareth Kunjunny Bhattachiripad, B.Stat. (ISI).
8. Vijay Vyankatesh Buche, B.Stat. (ISI).
9. Aloke Chakrabarti, B.Stat. (ISI).
10. Sathana Laxman Deshpande, B.Stat. (ISI).
11. Ueri Gangopadhyaya, B.Stat. (ISI).
12. Mary Kuriyan, B.Stat. (ISI).
13. Pachamuthu Lakshmanan, M.Sc. (Mathematics, Annamalai).
14. Dilip Shridhar Mande, M.Sc. (Mathematics, Nagpur).
15. Bibekendu Mazumdar, B.Stat. (ISI).
16. Mundtish Muralidharan, B.Stat. (ISI).
17. Om Parkash Nijhara, M.Sc. (Mathematics, Delhi).
18. Chellappan Sannathanna Pillai, B.Stat. (ISI).
19. Nannimangalam Dorairajan Prabhakar, B.Stat. (ISI).
20. Asit Baran Raha, B.Stat. (ISI).
21. Vanga Nagi Reddy, M.A. (Mathematics, Andhra).
22. Kamal Kumar Roy, B.Stat. (ISI).
23. Ranjit Kumar Roy, B.Stat. (ISI).



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24. Sarit Kumar Roy, B.Stat. (ISI).
25. Arijit Roy Choudhury, B.Stat. (ISI).
26. Ritabari Sen, B.Stat. (ISI).
27. Bibekananda Seth, B.Stat. (ISI).

*M. Stat. by thesis : 1965-66*

*(The subject of the thesis is mentioned after the name of each candidate)*

1. Kadaba Ramanija Ranganathi Iyengar, B.Sc. (Mysore), 2-year ISI training : *Selected papers on national income and saving.*
2. Graco Majumder (Mrs.), M.A. (Mathematics, Madras), 3-year ISI training : *Studies on state income and organised industries.*
3. Anandapurathi Sankara Menon Pankajakshan, M.Sc. (Statistics, Kerala), 3-year ISI training : *Some research studies in coconuts.*

III. Bachelor of Statistics : 1962-66

- |                          |                                 |
|--------------------------|---------------------------------|
| 1. Yash Paul Aneja       | 10. Ramesh Chander Kumar        |
| 2. Asit Kumar Banerjee   | 11. Samir Kumar Majumdar        |
| 3. Pranab Kumar Basu     | 12. Mohammed Hamid Moosa        |
| 4. Basudev Ghosh         | 13. Gogulapathi Ramakrishna     |
| 5. Prabhat Prasad Ghosh  | 14. Appa Rao                    |
| 6. Nirmalendu Goswami    | 15. Sukalyan Sengupta           |
| 7. Keshav Chander Gupta  | 16. Kamlesh Sharma              |
| 8. Jagdish Chandra Guria | 17. Kripasivthu Sikdar          |
| 9. Vinod Kumar Jain      | 18. Narasimhadevara Vijayaditya |

IV. STATISTICIAN'S DIPLOMA AND STATISTICAL FIELD SURVEY DIPLOMA

A. Statistician's Diploma

1965

1. Prakasa Rao Karituri, M.A. (Mathematics, Banaras)

1966

1. Sambhu Nath Bajpai, B.A. (Lucknow)
2. Narinder Kumar Gautam, B.A. (Punjab)
3. Vijay Chandra Jain, M.Sc. (Mathematics, Agra)
4. Jagdish Chander Malhotra, M.A. (Mathematics, Agra)
5. Prem Hundraj Manghani, M.A. (Mathematics, Punjab)
6. Prem Chand Mehrotra, M.Sc. (Mathematics, Agra)
7. Shiva Kumar Saksena, B.Sc. (Agra)
8. Bibhas Chandra Samal, B.Sc. (Calcutta)
9. Darshan Singh, M.A. (Mathematics, Punjab)
10. Dev Raj Taneja, M.A. (Mathematics, Punjab)
11. Palanarnori Ramachandran Vasudevan, B.Sc. (Madras)

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B. *Statistical Field Survey Diploma*  
1966

1. Lalit Mohan Chatterjee, M.A. (Economics, Vikram)

V. *DIPLOMA IN STATISTICAL QUALITY CONTROL: 1965-66*

1. Venkataraman Balasubramanian, Statistician's Diploma (ISI)
2. Lakshmi Narayan Goswami, M.Sc. (Operations Research, Delhi)
3. Pudiyerath Jayaram, B.E. (Chemical, Annamalai)
4. Narayana Rao Krishnamurthy, M.Sc. (Statistics, Karnatak)
5. Prativadi Bhayankaram Krishnaswamy Sampath M.A. (Statistics, Delhi)
6. Vudassery Kunjuvarced Jos, M.Sc. (Statistics, Kerala)
7. Yajuman Belludi Mallikarjunappa, B.Sc. (Textile, Bangalore)
8. Krishan Lal Nagpal, M.A. (Mathematical Statistics, Delhi)
9. Tattamangalau Parasuraman Gopalan, M.Sc. (Statistics, Kerala)
10. Kalanipakkam Masilamani Shanmugam, B.E. (Mechanical, Mysore)
11. Pramod Kumar Sinha, M.Sc. (Statistics, Lucknow)
12. Narayanaswami Subramaniam, B.E. (Electrical, Madras).

VI. *CERTIFICATES TO TRAINEES AT THE INTERNATIONAL STATISTICAL EDUCATION CENTRE,  
TWENTIETH TERM: 1966-67*

1. *Ceylon*

1. Galaboda Aratchige Shelton Perera, *Central Bank of Ceylon, Colombo.*
2. Ponniah Rasiah, *Department of Census and Statistics, Colombo.*
3. Ponnampalam Muthiah Sellathurai, *Department of Census and Statistics, Colombo.*

2. *Israel*

4. Musa Samuel Khamis

3. *Republic of Korea*

5. Tao Sub Joo, *Bureau of Statistics, Economic Planning Board, Seoul.*
6. Shin Hyun Kyoan, *Bureau of Statistics, Economic Planning Board, Seoul.*
7. No Ik Song, *Bureau of Statistics, Economic Planning Board, Seoul.*

4. *Federation of Malaysia*

8. Velupillai Arasaratnam, *Institute for Medical Research, Kuala Lumpur.*
9. Ling Sing Tiong, *Department of Statistics, Kuching.*

5. *Nepal*

10. Dhana Bahadur Manandhar, *Central Bureau of Statistics, Kathmandu.*
11. Sher Bahadur Mishra, *Central Bureau of Statistics, Kathmandu.*

6. *Nigeria*

12. Emmanuel Ukachuku Nduneri, *Ministry of Finance and Economic Planning, Enugu.*
13. Olubisi Ayodele Odejimi, *National Office of Statistics, Lagos.*

7. *Philippines*
  14. Rene Rodolfo Calado, *Bureau of Public Schools, Manila.*
  15. Bartolome Carroon Del Rosario, *Central Bank of Philippines, Manila.*
  16. Aurora Poblacon Berenguel, *Bureau of the Census and Statistics, Manila.*
8. *Thailand*
  17. Wichien Udampol, *Customs Department, Bangkok.*
  18. Sunee Gadetragoon, *Department of Mathematics, Chulalongkorn University, Bangkok.*
  19. Dhanya Nana, *Planning Division, Department of Highway, Ministry of National Development, Bangkok.*
  20. Chintana Pejaranonda, *National Statistical Office, Bangkok.*
9. *Uganda*
  21. Fugene Okia, *Statistics Division, Ministry of Planning and Economic Development, Entebbe.*

#### Annexure 5 : List of Scientific Papers

##### 5.1. PAPERS PUBLISHED

###### A. Statistics

- P1. GHOSH, J. K. (with Singh, R.) (1966) : Unbiased estimation of location and scale parameters, *Ann. Math. Stat.*, 37, 1671-1675.
- P2. HANURAV, T. V. (1966) : Some aspect of unified sampling theory, *Sankhyā*, sr. A, 28, 175-204.
- P3. IYER, M. R. (with Menon, V. V. ) (1966) : On coloring the  $n \times n$  chessboard, *American Mathematical Monthly*, 73, 7 721-726.
- P4. KRISHNAN, T. (1966) : On the threshold order of a Boolean Function, *IEEE Transactions on Electronic Computers*, EC, 16, 360-373.
- P5. LAKSHI, D. B. (1966) : Congruence for Fourier co-efficients of modular invariant  $j(T)$ , *Proc. National Institute of Sciences of India*, 32, A. 1, 95-103.
- P6. MATRA, A. (1966) : A note on undiscounted dynamic programming, *Ann. Math. Stat.*, 37, 1042-1047.
- P7. PADMANABHAN, A. R. (1966) : Some dominated convergence theorems in a von Neumann Algebra, *Proc. Japan Academy*, 42, 4, 347-350.
- P8. PARTHASARATHY, T. (1966) : A note on compound simple games, *Proc. Amer. Math. Soc.*, 17, 1334-1340.
- P9. PATRAK, P. K. (1966) : Alternative proofs of some theorems of characteristic functions, *Sankhyā*, sr. A, 28, 309-314.
- P10. ——— (1966) : An estimator in pps sampling for multiple characteristic, *Sankhyā*, sr. A, 28, 35-40.
- P11. ——— (1966) : Inadmissibility of customary estimators in sampling over two occasions, *Sankhyā*, sr. A, 29, 49-54.

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- P12. RAMANUJACHARYULU, C. (1966) : Non-linear spaces in the construction of symmetric BIB designs, *Sankhyā*, sr. A, 27, 409-414.
- P13. ——— (1966) : A new general series of balanced incomplete block designs, *Proc. Amer. Math. Soc.*, 17, 5, 1064-1068.
- P14. ——— (1967) : On colouring a polygen and restricted random graphs, *Acta des Journées sur la Théorie des Graphes ICC*, Dunod, 241-264.
- P15. RAMOUANDRAN, B. (1966) : On one-sided distribution functions, *Sankhyā*, sr. A, 28, 315-318.
- P16. RAMOUANDRAN, G. (1966) : Possible test for the I 41 I-O weak nuclear force, *II Nuove Cimento* 44, 218.
- P17. ——— (1966) : Pion scattering on nuclei, *Nuclear Physics*, 87, 107.
- P18. RAO, C. R. (1966) : Discriminant function between composite hypotheses and related problems, *Biometrika*, 53, 315-321.
- P19. ——— (1966) : Characterisation of the distribution of random variables in linear structural relations, *Sankhyā*, sr. A, 28, 251-260.
- P20. ——— (with Rao, M. N.) (1967) : Linked cross-sectional study for determining norms and growth curves—a pilot survey on Indian school-going boys, *Sankhyā*, sr. B, 28, 231-252.
- P21. ——— (1967) : On some characterisations of the normal law, *Sankhyā*, sr. A, 29, 1-14.
- P22. RAO, G. DIVAKAR (1966) : On sampling schemes to estimate differences in prices on two occasions, *Sankhyā*, sr. B, 28, 219-228.
- P23. SETHURAMAN, J. (with Saraga, I. R.) (1967) : Stopping time of rank-order sequential probability ratio tests on Lehmann alternatives, *Aus. Math. Stat.*, 37, 1154-1160.
- P24. SENOH, M. P. (1966) : Efficiency of systematic sampling in ratio and product estimation, *Metrika*, 10, 199-205.

B. Anthropometry

- P25. BASU, A. (1965) : Hairy ears among the Pahira, *Acta Geneticae Medicae et Gemellologiae*, 14, 317-325.
- P26. ——— (1966) : A note on the ear lobe, *Acta Genetica et Statistica Medica*, 16, 184-185.
- P27. ——— (1966) : ABO blood groups and small-pox among the Pahira, *Nucleus*, 9, 209.
- P28. ——— (with Sarkar, J., Roy, B., Das Gupta, P., Sanyal, A. and Sarkar, S. S.) (1966) : Anthro-pogenetic investigations in the Dalma and the Ajodhya hills and their neighbourhood, *Science and Culture*, 32, 5, 273-275.
- P29. CHAKRAVARTI, M. R. (with Vogel, F.) (1966) : ABO blood groups and the type of leprosy in an Indian population, *Human-genetik*, 3, 186-188.
- P30. ——— (with Vogel, F.) (1966) : ABO blood groups and small-pox in rural population of West Bengal and Bihar, *Human Genetics*, 3, 166-180.

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- P31. PAKRASHI, K. (1966) : On some social aspects of fertility and family in India, *Indian Journal of Social Work*, 27, 2, 153-161.
- P32. ——— (1966) : Caste, family structure and mode of migration among the refugees of West Bengal 1947-48, *Indian Journal of Social Work*, 7, 2, 145-154.
- P33. ——— (1966) : A study of widowhood in India, 1951, *Bulletin of the Cultural Research Institute*, 5, 1 & 2, 67-74.
- P34. ——— (1966) : A study on agrarian regions and villages of West Bengal 1951, *Bulletin of the Socio-Economic Research Institute*, 2, 1, 11-21.
- P35. ——— (with Roychowdhury, T.) (1966) : A neolith from Son Valley, *Oriental Science*, 35, 21, 549-550.

C. Biometry

- P36. DAS, B. C. (1966) : Multivariate investigations of blood chemistry and morphology, Malhotra, M. S. (Ed.), *Human Adaptability to Environments and Physical Fitness*, Defence Institute of Physiology and Allied Sciences, Madras, 379-394.

D. Computer and Cybernetics

- P37. DUTTA, A. K. and DUTTA MAJUMDAR, D. (1966) : A scheme for automatic human speech coding and recognition procedure, *Proc. Symposium on Control and Computation in India*, 10-11.
- (P37) DUTTA MAJUMDAR, D. and DUTTA, A. K. (1966) : A scheme for automatic human speech coding and recognition procedure, *Proc. Symposium on Control and Computation in India*, 10-11.
- P38. KRISHNAMOORTY, E. V. and NAMDI, S. K. (1966) : A simple algorithm for digital division, *Proc. Symposium on Control and Computation in India*, 2-3.

E. Crop Science

- P39. DAVIS, T. A. (1966) : Floral structure and stamens in *Bombax Cerebal*, *J. Genet.*, 69, 294-328.
- P40. ——— (1966) : Nest-structure of a social wasp varying with siting leaves, *Nature*, 210, 968-967.
- P41. ——— (with Pillai, N. G.) (1966) : Effect of magnesium and certain micro-nutrients on root (wilt) affected and healthy coconut palms in India, *Oleagineux*, 21, 669-674.
- P42. ——— (with Kundu, A.) (1966) : Aestivation of perianths of *Areca catechu* Linn. fruits, *J. Bombay Nat. Hist. Soc.*, 63, 270-282.
- P43. ——— (1966) : Morphology of horns in exceptional fruits of six palm species, *Phytomorphology*, 16, 314-326.
- P44. ——— (1966) : Observations on *Ropalidia variegata* (Smith) (Hymenoptera : Vespidae), *Entomological News*, 77, 271-277.
- P45. ——— (1967) : Food from palms, *Science Reporter*, 4, 70-76.
- P46. ——— (1967) : Foliation of coconut spadices and flowers, *Oleagineux*, 22, 19-23.

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### F. Demography

- P47. MAHALANOBIS, P. C. (1966): Some concepts of sample surveys in demographic investigations, *Sankhyā* sr. B, 28, 199-204.
- P48. RAMAN, M. V. (1966): A broad view of mortality trends, causes of death and medical facilities in India, *Indian Medical Gazette*, 5, 65-70.
- P49. SENOUPTA, J. M. (1966): On the validity of fertility data collected through interview, *Sankhyā*, sr. B, 28, 269-288.

### G. Documentation and Library Science

- P60. BHATTACHARYYA, G. (1966): Review of *Searcher's Manual*, *Herald of library science*, 5, 235-6.
- P51. ——— (1966): Natural resources and documentation, Ranganathan, S. R. and Neelameghan, A. (Ed), *Library service for all*. Mysore Library Association. Chap. F.
- P52. ——— (with Neelameghan, A.) (1966): Project method in teaching library science, *Lib. Sc.* 3, Paper V.
- P53. ——— (with Bhattacharyya, M.) (1966): Library science: depth classification, *Fourth DRTC Seminar*, Paper N.
- (P70) ——— (with Neelameghan, A.) (1966): Production engineering of locomotive: depth classification, *Lib. Sc.* 3, Paper P.
- (P71) ——— (with Neelameghan, A.) (1966): Precourse apprenticeship for B *Lib. Sc.*, *Lib. Sc.* 3, Paper T.
- (P72) ——— (with Neelameghan, A.) (1966): Discussion method in teaching library science, *Lib. Sc.* 3, Paper U.
- (P73) ——— (with Neelameghan, A.) (1966): Teaching of cataloguing, *Lib. Sc.* 3, Paper Y.
- (P74) ——— (with Neelameghan, A.) (1966): Teaching of classification, *Lib. Sc.* 3, Paper ZA.
- (P75) ——— (with Neelameghan, A.) (1967): Invoking the help of the subject specialist, *Lib. Sc.* 4, Paper G.
- (P76) ——— (with Neelameghan, A.) (1966): Choice of principle of helpful sequence, *Tenth Indian Standards Convention, Ernakulam. Standards for Technical Editors and Publishers*, Paper S-7/A: 2.
- (P77) ——— (with Neelameghan, A.) (1966): Article in a periodical, Prelims. *Tenth Indian Standards Convention, Ernakulam. Standards for Technical Editors and Publishers*, Paper S-7/B: 2.
- (P78) ——— (with Neelameghan, A.) (1966): Derivation of basic class with particular reference to "Commodity production engineering". *Fourth DRTC Seminar*, Paper J.
- (P84) ——— (with Neelameghan, A. and Gupta, A. K.) (1967): Interpolation in the notational plane, *Lib. Sc.* 4, Paper B.
- (P85) ——— (with Neelameghan, A. and Saha, J.) (1967): Librarian-Research worker partnership for better library service, *Seminar on Social Science Research and Library Development in India*, New Delhi, Indian School of International Studies.

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- (P63) BHATTACHARYYA, M. (with Bhattacharyya, G.) (1966) : Library science, depth classification, *Fourth DRTC Seminar*, Paper N.
- P64. GOPNATH, M. A. (1966) : DRTC research cell : A report for 1966, *Fourth DRTC Seminar*, Paper ZA.
- P65. ——— (1966) : March of library legislation in India, Ranganathan, S. R. and Neelameghan, A. (Ed.) *Library service for all*, Mysore Library Association. Chap E.
- P66. ——— (1966) : Mysore Library Association—Library Week and Book Exhibition, 5 to 11 November 1966, *Iastic Bulletin*, 11, 252-8.
- P67. ——— (1966) : Preparation of an alphabetical index to a book, *Tenth Indian Standards Convention*, Ernakulam, *Standards for Technical Editors and Publishers*, Paper S-7/B : 3.
- P68. ——— (1967) : Preparation of an index to a book : A case study, *Lib. Sc.* 4, Paper E.
- P69. ——— (with Malhotra, V. K.) (1966) : Geographical schedule in CC, DC, and UDC, *Lib. Sc.* 3, Paper K.
- P60. ——— (with Neelameghan, A.) (1966) : Colloquium in teaching library science, *Lib. Sc.* 3, Paper W.
- (P79) ——— (with Neelameghan, A.) (1966) : Division of an array isolate in [IP1] and in later level : A case study, *Herald of library science* 5, 180-2.
- (P80) ——— (with Neelameghan, A.) (1966) : Grouping of quasi isolates, *Fourth DRTC Seminar*, Paper K.
- P61. NEELAMEGHAN, A. (1966) : Knowledge-availability and agricultural productivity, *Proc. Agricultural Productivity Seminar*, Bangalore.
- P62. ——— (1966) : Cooperate or bust, Ranganathan, S. R. and Neelameghan, A. (Ed.) *Library service for all*, Mysore Library Association. Chap D.
- P63. ——— (1966) : In the service of the GP, Ranganathan, S. R. and Neelameghan, A. (Ed.) *Library service for all*, Mysore Library Association.
- P64. ——— (1966) : 'Existence' as a common property isolate, *Herald of library science*, 5, 233-5.
- P65. ——— (1966) : Cataloguing, theory and practice (Review). *ISI Bulletin*, 18, 239-40.
- P66. ——— (1966) : Classified arrangement in a technical glossary, *ISI Bulletin*, 456-7.
- P67. ——— (1966) : Analytico-synthetic classification in perspective, *Lib. Sc.* 3, Paper L.
- P68. ——— (1967) : Research in library science : Its need and its promotion, *Lib. Sc.* 4, Paper C.
- P69. ——— (1966) : Research in library science : The why and the how, *Seminar on the Teaching of Library Science*, University of Delhi.
- P70. ——— (with Bhattacharyya, G.) (1966) : Production engineering of locomotive : Depth classification, *Lib. sc.* 3, Paper P.
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- P72. NEELAMBOLAN, A. (with Bhattacharyya, G.). (1966): Discussion method in teaching library science, *Lib. sc.* 3, Paper U.
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- P79. ——— (with Gopinath, M. A.). (1966): Division of an array isolate in [IP1] and in later level: A case study, *Herald of library science*, 5, 160-2.
- P80. ——— (with Gopinath, M. A.). (1966): Grouping of quasi isolates, *Fourth DRTC Seminar*, Paper K.
- (P60) ——— (with Gopinath, M. A.). (1966): Colloquium in teaching library science, *Lib. sc.*, 3, Paper W.
- (P107) ——— (with Ranganathan, S. R. (1967): Part of single-volumed simple book: Standards for bibliographical reference. *Lib. sc.* 4, Paper D.
- P81. ——— (with Ranganathan, T.). (1966): Air vehicle wing production: depth classification, *Fourth DRTC Seminar*, Paper P.
- P82. ——— (with Sangameswaran, S. V.). (1966): Array division with packet notation: A case study. *Fourth DRTC Seminar*. Paper L.
- P83. ——— (with Sangameswaran, S. V.). (1966): Scheduled mnemonics in depth classification: A case study. *Fourth DRTC Seminar*. Paper M.
- P84. ——— (with Bhattacharyya, G. and Gupta A. K.). (1967): Interpolation in the notational plane, *Lib. sc.* 4, Paper B.
- P85. ——— (with Saha, J. and Bhattacharyya, G.). (1967): Librarian-research worker partnership for better library service, *Seminar on Social Science Research and Library Development in India*. New Delhi, Indian School of International Studies.
- P86. RANGANATHAN, S. R. (1966): Library science and its development. *State Book Festival*. 5-8.
- P87. ——— (1966): Some personalities in the Punjab world. *Commemoration Volume of the Golden Jubilee of the Punjab Library Association*.



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- P88. RANGANATHAN, S. R. (1966) : Library service and the resources of Independent *The Mysore economic review, Independence Day Number*, 64-6.
- P89. ——— (1966) : Education and research in library science. *Cultural Forum Special Number on Libraries in India—Retrospect and Prospect*.
- P90. ——— (1967) : Hidden roots of classification, *Lib.sc.* 4 ; Paper A.
- P91. ——— (1966) : Development in notational plans upto primitive faoeted notation, *Lib.sc.* 3, Paper M.
- P92. ——— (1966) : Emergence of library science, *Lib.sc.* 3, Paper A.
- P93. ——— (1966) : Education for documentalists, *Lib.sc.* 3, Paper C.
- P94. ——— (1966) : Vitalising the university education of librarians, *Lib.sc.* 3, Paper R.
- P95. ——— (1966) : Areas for standardisation in the production of books and articles, *Tenth Indian Standards Convention, Ernakulam. Standards for Technical Editors and Publishers*, Paper S-7/A : 1.
- P96. ——— (1966) : Public library system and cultivation of human resources, *Public Library, Bangalore, Golden Jubilee Souvenir. Articles Section*, 9-17.
- P97. ——— (1966) : Why, what, and how of school library system. *Indian Library Association Conference, Chandigarh. Souvenir*. 51-5.
- P98. ——— (1966) : University course in library science with special reference to the M.Lib.Sc. Course, *Seminar on the teaching of library science*. University of Delhi. Paper 1.
- P99. ——— (1966) : My LA, The messenger of light, Ranganathan S. R. and Neelameghan, A. (Ed.) *Library service for all*. Mysore Library Association, Chap. A.
- P100. ——— (1966) : Mysore library grid—A vision. Ranganathan, S. R. and Neelameghan, A. (Ed.) *Library service for all*. Mysore Library Association, Chap. A.
- P101. ——— (1966) : Subject, quasi-subject, and subject-bundle. *Fourth D??C Seminar*, Paper C.
- P102. ——— (1966) : Freely faoeted classification, *Fourth DRTC Seminar*, Paper G.
- P103. ——— (1966) : Energising university library service *Seminar on University Librarians, Rajasthan University*. Paper IX-A-1.
- P104. ——— (1967) : Modern records management : basic guide to records control, filing and information retrieval (Review). *The Hindu*. 5 Feb.
- P105. ——— (with Bhattacharyya, G.) (1966) : Hospitality in the notational plans, *Lib.sc.* 3, Paper J.
- P106. ——— (with Gopinath, M. A.) (1966) : Bridge between typescript and print, *Tenth Indian Standards Convention, Ernakulam*. Paper S-7/D : 1.
- P107. ——— (with Neelameghan, A.) (1967) : Part of single-volumed simple book : standards for bibliographical reference, *Lib.sc.* 4, Paper D.
- P108. SAMA, J. : Documentation training in India. *Proc. International Federation of Documentation—1965 Congress*.
- (P86) ——— (with Bhattacharyya, G. and Neelameghan A.) (1967) : Librarian-research worker partnership for better library service, *Seminar on social science Research Development in India*, New Delhi, Indian School of International Studies.

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- P109. SUBBA RAO, C. V. (1968) : Nemesis overtakes subject approach in the stack, *Herald of Library Science*, 6, N2 ; 135-140.

### H. Geology

- P110. BAKSI, S. K. (1966) : On the foraminifera from Raghavapuram Mudstone, West Godavari district, Andhra Pradesh, *Bull. Geol. Min. Met. Soc.*, 37, 1-19.
- P111. RAYCHAUDHURI, B. (1966) : An attempt to determine Fe-Mg. content of hornblendes by X-ray diffractometric method. *Jour. Geol. Soc. Ind.*, 7, 100-109.
- (P36) ROY CHOWDHURY, T. (with Pakrasi, K.). (1966) : A neolith from Son valley. *Current Science*, 35, 21, 549-550.
- P112. SENGUPTA, S. (1966) : Geological and geophysical studies in western part of Bengal basin, India. *Bull. Amer. Assoc. Petrol. Geol.* 50, 1001-1017.
- P113. SENGUPTA, S. (1966) : Orientation and imbrication of pebbles with respect to cross-stratification. *Jour. Sed. Petrology*, 36, 362-369.
- P114. ——— (1966) : Statistical analysis of cross-bedding azimuths from Kamthi formation around Bhoemaram, Pranhita-Godavari Valley (with an appendix by Rao, J. S.), *Sankhyā*, 28, Sr.B, 165-174.

### I. Network Theory

- P115. MITRA, S. K., (1966) : Pfaflian aggregate and network theorems, *Proc. Symposium on Control and Computation in India*, 17-18.

### J. Planning, Economic Statistics and Econometrics

- P116. CHATTERJEE, A. (1966) : A study on agricultural growth during 1955-1963 in India, *Indian Journal of Agricultural Economics*, XXI, 4, 192-200.
- P117. DASS B. N. (1966) : Regional potential in consumption and production of cereal crops in India : Rice—A case study, *A.I.C.C. Economic Review*, 18, 6, 15-21.
- P118. DATTA CHAUDHURI, M., (1966) : Export subsidy scheme, *Economic and Political Weekly*, 1, 9, 375-382.
- P119. DUTTA-MAZUMDAR, DEBKUMAR (1967) : Estimates of demand for service items in India during Third and Fourth Five-year Plans, *Proc. 54th Indian Science Congress* 42.
- P120. MAITRA, PRIYOTOSH (1966) : A note on the concept of import substitution, *Economic Affairs*, 10, June 1966, 272-280.
- P121. ——— (1966) : Devaluation—some fallacies, *Economic Affairs*, *Devaluation Number*, 10, 425-434.
- P122. MAZUMDAR, H. (1966) : On the sterility of Indian economic thinking : A discussion of Professor Price's papers on Ranado. *Explorations in Entrepreneurial History*, 4 (second series), 1, 53-56.
- P123. MENHAS B. S., (1966) : Measurement of agricultural growth, *Indian Journal of Agricultural Economics*, XXI, 4, 166-182.

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- P124. MUKHERJEE, M. (1967) : Long period growth of national income in India. *Quarterly Journal of Indian Studies in Social Science*, 1, 1, 16-26.
- P125. ——— (1967) : Non-monetary transaction in Indian economy. *Kaadi Gramodyog*, 367-372.
- P126. ——— (1967) : On the estimation of the growth of technical man-power in India. *Economic Affairs*, XII, 1, 41-48.
- P127. PAL, M. N. and SUBRAMANIAN C., (1966) : Indian planning : the need for greater emphasis on regional development, *A.I.C.C. Economic Review*, 18, 3, 33-39.
- P128. ——— (1966) : Differential regional pattern of consumption of commodities in India, *A.I.C.C. Economic Review* 10, 5, 7-12.
- P129. ROY, A. : (with Sen Gupta, J. M. and Taluqdar, J. N.) (1966) : Some studies relating to the valuation in the rates of consumption and purchase for a few selected food items, *Sankhyā*, sr. B, 28, 67-114.
- (P129) SENGUPTA, J. M. (with Roy, A. and Taluqdar, J. N.) (1966) : Some studies relating to the valuation in the rates of consumption and purchase for a few selected food items, *Sankhyā*, sr. B, 28, 67-114.
- P130. ——— (1966) : An experimental study for the estimation of total cereals in rural households, year 1960-61, *Sankhyā*, sr. B, 28, 141-164.
- P131. ——— (1966) : Enumeration of fruit trees in land utilisation surveys, *Sankhyā*, sr. B, 28, 289-292.
- P132. ——— (1966) : Exploitation of fish in tanks and ponds, West Bengal 1957-61, *Sankhyā*, sr. B, 28, 292-306.
- P133. ——— (with Sinha, A.) (1966) : Some studies on the consumption of food and clothing, *Sankhyā*, sr. B, 28, 115-140.
- (P133) SINHA, A. (with Sengupta, J. M.) (1966) : Some studies on the consumption of food and clothing, *Sankhyā*, sr. B, 28, 115-140.
- (P129) TALUQDAR, J. N. (with Sengupta, J. M. and Roy, A.) (1966) : Some studies relating to the variation in the rates of consumption and purchase for a few selected food items, *Sankhyā*, sr. B, 28, 67-114.
- P134. VIJOD PRAKASH (1966) : Production concentration and the consumer—comments on a point touched by the Monopolies Inquiry Commission, *Artha Vijnana*, 8, 2, 172-185.
- P135. ——— (1966) : On measures of product-wise concentration, *Artha Vijnana*, 8, 3, 309-319.

K. Psychometry

- P136. CHATTERJEE, S. (with Mukherjee, M.) : (1966) Modern objective tests—What can they do for us? *The Mind*, 5, 1, 5-8.
- P137. ——— (with Mukherjee, M.), (1966) : A review of merit rating methods, *Indian Psychological Review*, 3, 1, 21-32.

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- (P136) MUKHERJEE, M. (with Chatterjee, S.) (1968) : Modern objective tests—what one they do for us ? *The Mind*, 6, 1., 5-8.
- (P137) MUKHERJEE, M. (with Chatterjee, S.) (1968) : A review of merit rating methods, *Indian Psychological Review*, 3, 1, 21-32.

L. *Sociology*

- P138. MUKHERJEE, R. (1968) : Recent trends of sociological studies on rural society in India, *Ajia Keitai*, 88-100.

5.2. PAPERS SUBMITTED FOR PUBLICATION

(The journal to which the paper has been submitted for publication is mentioned within brackets)

A. *Statistics*

- S1. BASU, D. : Problems relating to the existence of maximal and minimal elements in some families of statistics (sub-fields) (*Proc. 5th. Berkeley Symposium*).
- S2. ——— : On sufficiency and invariance (*Professor S. N. Roy Memorial Volume*, University of North Carolina, USA).
- S3. ——— : (with Ghosh J. K.) : On invariant sets for location parameter families of probability measures (*Ann. Math. Stat.*).
- S4. DAS GUPTA, P. : Tables of the non-centrality parameter of F-test as a function of power (*Biometrika*).
- S5. DAS GUPTA, S. : Step-down multiple decision rules (*Professor S. N. Roy Memorial Volume*, University of North Carolina, USA).
- S6. ——— : Inference on discrimination coefficients, (*Sankhyā*).
- (S3) GHOSH, J. K. (with Basu D.) : On invariant sets for location parameter families of probability measures (*Ann. Math. Stat.*).
- S7. ——— : (with Singh, R.) : Estimation of the reciprocal of the scale parameter in the gamma density. (An admissible invariant estimator is found for the reciprocal), (*Ann. Math. Stat.*).
- S8. IYER, M. R. : On particular values of the derivatives of the gamma function (*Bulletin, Calcutta Mathematical Society*).
- S9. ——— : A note on Fibonacci Quaternions (*Bulletin, Calcutta Mathematical Society*).
- S10. ——— : Sums involving Fibonacci numbers (*Bulletin, Calcutta Mathematical Society*).
- S11. JACOB, PATUL : (with Sengupta J. M.) : Some results on the estimation of tobacco yield (*Sankhyā*).
- S12. ——— : (with Sengupta, J. M.) : A technique for yield estimation surveys in forest like plantations (*Sankhyā*).
- S13. KRISHNAN, T. : On the threshold order of a Boolean function-II (*IEEE Transactions Electronic Computers*).
- S14. ——— : A generalized Probit model for item analysis (*Psychometrika*).

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815. LALITHI, D. B. : Identities connecting the Partition Divisor and Ramanujan's functions (*Proc. National Institute of Sciences of India*).
816. MITTAL, M. L. : A note of resolution of degeneracy in transportation problems (*Journ. Opern. Res. Quarterly*, London).
817. MURTHY, M. N. : A note on estimation of variance components in a multistate sampling design based on interpenetrating sub-samples (*Metrica*).
818. ——— : (with Singh, M. P.) : Some aspects of recent development in sampling theory (*Seminar Volume*, Banaras Hindu University).
819. MURTHY, U. S. R. : On some external graphs (*Acta. Mathematica*).
820. NATARAJAN, S. (with Viswanath, K.) : Quaternionic representations of compact metric groups (*Journ. Math. Physics*).
821. PADMANABHAN, A. R. (with Rao, B. V.) : Ideals in some special lattices (*Proc. Amer. Math. Soc.*).
822. PARTHASARATHY, T. : Solutions for product simple games (*Proc. Amer. Math. Soc.*).
823. ——— : Solutions for product simple games-II (*Proc. Amer. Math. Soc.*).
824. PATILAK, P. K. (with Krishnaiah, P. R.) : A note on confidence bounds for certain ratios of characteristic roots of covariance matrices (*Ann. Math. Stat.*).
825. RAMANUJACHARYULU, C. : On forms of quadrics in finite projective geometry (*Journ. Ind. Stat. Assoc.*).
826. ——— : Statistical analysis of sociological structures (*Psychometrika*).
827. ——— : A note on symmetric balanced incomplete block designs (*Proc. Amer. Math. Soc.*).
828. RAO, C. R. : On characterization of multivariate normal distributions (*Sankhyā*).
829. ——— : Cyclical generation of linear subspaces in finite geometries (*Symposium on Combinatorial Mathematics at Chapel Hill, USA*).
830. ——— : Calculus of generalised inverse of matrices, Pt. 1 : General theory (*Sankhyā*).
831. RAO, T. J. : On the allocation of sample size in stratified sampling (*Ann. Math. Stat.*).
832. ——— : On the choice of a strategy for ratio method of estimation (*Journ. Roy. Stat. Soc.*).
833. RAMACHANDRAN, G. : Recoil polarization and structure of the deuteron (*Nuclear Physics*).
834. ——— : Tensor polarisation of deuterons following elastic scattering of protons (*Physics Letters*).
835. SAHA, R. P. : Statistical methods in the estimation of foodgrains in India (*Proc. 54th Indian Science Congress, 1967*).
- (S11) SENGUPTA, J. M. (with Jacob, Paul) : Some results on the estimation of tobacco yield (*Sankhyā*).
- (S12) ——— (with Jacob, Paul) : A technique for yield estimation of surveys in forest like plantations (*Sankhyā*).

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- S36. SENGUPTA, J.M.: Sampling errors in the estimation of fertility rates (*Sankhya*).
- S37. ———: Size of sampling units in two-stage sampling for the estimation of percentage area under autumn and winter crops in West Bengal (*Sankhya*).
- S38. SETHURAMAN, J.: Probabilities of deviations (*Professor S. N. Roy Memorial Volume*, University of North Carolina, USA).
- S39. SINGU, M. P.: Estimating the non-linear parametric function of a finite population (*Ann. Math. Stat.*).
- S40. ———: Ratio-cum-product method of estimation (*Metrika*).
- S41. VENUGOPALARISHNA, U.: On the Kernel theorem of Schwartz (*Ann. Math. Stat.*).
- (S19) ——— (with Murthy, M. N.): Some aspects of recent development in sampling theory (*Seminar Volume*, Banaras Hindu University).
- S42. VIJAYAN, K.: On the exact  $\pi P^*$  sampling scheme (*Journ. Roy. Stat. Soc.*).

B. Anthropometry

- S43. BASU, A.: Selection intensity among the Pahira (*Eugenics Quarterly*).
- S44. ———: A note on the distribution of the taste sensitivity genes in India (*Acta Genetica et Statistica Medica*).
- S45. ———: Hairy ears among the Kota (*Bulletin, Cultural Research Institute, Govt. of West Bengal*).
- S46. PAKRASI, K.: Occupation class, migration and family structures among the refugees of West Bengal, 1947-48 (*Man in India*).
- S47. ———: Female infanticide before a century in India (*Bulletin, Socio-economic Research Institute*).

C. Biometry

- S48. DAS, B. C.: Effects of micro-nutrients on the survival and growth of Indian carp fry (*Proc. FAO World Symposium on Warm Water Pond Fish Culture, Rome*).
- S49. ———: Changes in physio-chemical processes with age (*Proc. National Institute of Sciences of India*).
- S50. ———: Report on India 1962-1966 to the Standing Committee on Fresh water sciences, Pacific Science Association (*Proc. Eleventh Pacific Science Congress*).
- S51. ———: (with Das, Rhea S.): Transitional probabilities and the estimation of need for hospital services (*Theoretical Biology*).
- (S51) DAS, RHEA S. (with Das, B. C.): Transitional probabilities and the estimation of need for hospital services (*Theoretical Biology*).

D. Biochemistry

- S52. PAL, P. R. (with Lodh, S. B.): Amine acid hydrazides as inhibitory analogues for *E. Coli* and *S. Carlsbergensis* (*Science*).

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E. Crop Science

- S53. DAVIS, T. A. : Stamen-number and pollen-size in some levo—and dextro-rotory flowers of Bombacaceae (*Review Palaeobot.*).
- S54. ——— : Ramifying and twisting stems of *Palmyra* palm (*Borassus flabellifer*, L.), (*Principes*).
- S55. ——— : A 2<sup>2</sup> confounded design for a manurial experiment on cocoon (*Sankhya*).
- S56. ——— : Pre-foilation in *Pothos scandens*, linn. (*Bull. Jardin Bot. de l'Etat.*).
- S57. ——— : (with Ghosh, S. S.) : Foliar spiral and ptyxis in *Cordyline rubra* (*Phytomorphology*).

F. Demography

- S58. CHAKRAVARTY, B. : A sixteen-year trend with regional mortality in India 1947-1963—Bombay City (*Indian Medical Gazette*).
- S59. ——— : A sixteen-year trend in the regional mortality in India 1947-1963—Calcutta City (*Indian Journal of Public Health*).
- S60. MALAKAR, C. R. (with Pakraji, K.) : On relation between family type and fertility (*Milbank Memorial Fund Quarterly*).
- (S60) PAKRAJI, K. (with Malakar, C. R.) : On relation between family type and fertility (*Milbank Memorial Fund Quarterly*).
- S61. RAMAN, M. V. : An examination of data on age of death obtained from two sources (*Indian Journal of Public Health*).
- S62. ——— : A critique of some of the targets for IUCCD and sterilization (*Target Setting*).

G. Documentation and Library Science

- S63. BHATTACHARYYA, G. (with Neelameghan, A.) : Education in documentation with special reference to the DRTC (*International Conference on Education in Scientific Information Work* (April 1967) (London).
- S64. ——— (with Ranganathan, S. R.) : Names of the places of a periodical conference (*Lib. sc. 4*; Paper J).
- S65. GOPINATH M. A. : Emptying digit for interpolation in the notational plane (*Australian library journal*. Library Association of Australia, Sydney).
- S66. ——— (with Neelameghan A.) : Universal vs special scheme of classification (*Libri*).
- S67. ——— (with Neelameghan, A. and Denton, P.) : Motor vehicle production : depth classification (*Lib. sc. 4*; Paper H).
- S68. NEELAMEGHAN, A. : Keeping up with social pressure (*Herald library science*).
- (S63) ——— (with Bhattacharyya, G.) : Education in documentation with special reference to the DRTC (*International Conference on Education in Scientific Information Work* (April 1967) (London).

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- (S86) LEBLAMCHHAN, A. (with Gopinath, M. A.) Universal or special scheme of classification (*Libri*).
- (S87) ——— (with Gopinath, M. A. and Denton, P.): Motor vehicle production: depth classification. (*Lib. sc. 4*; Paper H).
- S89. RAMANATHAN, S. R.: Statute of the second law and humanism in library service (*Dr. Prof. Horst Kunze Festschrift*, East Germany).
- (S63) ——— (with Bhattacharyys, G.): Names of the places of a periodical conference (*Lib. sc. 4*; Paper J).
- S70. SAHA, J.: Social science research centres in India (*International conference on comparative research on social change and regional disparity within and between nations with special reference to Southern Asia*).
- S71. SUBBA RAO, C. V.: Summing up—seminar technique—4 (*IASLIC Bulletin*).
- S72. ———: Library education: degree and diploma: part-time students and teachers (*IASLIC Bulletin*).

### H. Family Planning

- S73. SENGUPTA, A.: A study on the promotion of knowledge of contraception by education programme in family planning, 1965 (*Journal of Social Welfare*).
- S74. ———: Programme building operation for promotion of family planning: The ISI clinic experiment (*Indian Medical Journal*).

### I. Geology

- S75. BAKSI, S. K.: A new occurrence of *Dadoxylon agathicides* Krausel and Jain, 1964 (1963) from Raghavapuram Mudstone, Andhra Pradesh (*Science and Culture*).
- S76. CHATTERJEE, SANJAY: New discoveries contributing to the stratigraphy of the continental Triassic sediments of the Pranhita-Godavari Valley (*Bull. Geol. Soc. Ind.*).
- S77. ———: New and associated Phytosaur material from the Upper Triassic Maleri formation of India (*Bull. Geol. Soc. Ind.*).
- S78. ROY CHOWDHURY, T.: Triassic vertebrates from the Gondwanas of India (*Gondwana Volume—Collected Papers*).
- S79. SEN GUPTA, S.: Grain-size frequency distributions as indicator of depositional environment in some Gondwana rocks (*Seventh Intl. Sect. Congress, England*).

### J. Planning, Economic Statistics and Econometrics

- S80. BHATT, L. S.: Regional growth approach for industrialisation and urbanisation of the Kanpur region (*Proc. International Seminar on Urban and Industrial Growth of Kanpur Region, IIT, Kanpur*).
- S81. CHATTERJEE, G. S. and МУХЛЕВЪВ, М.: Trends in the distribution of national income in India, 1950-51 to 1965-66 (*Conference Volume, Seminar on Preconditions for Socialist Advance in India, December 1966*).



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882. DUTTA-MAENDAR, DEEKUMAR : Relative merits of estimating Engel elasticity from specific concentration curves (*Econometric Annual of Indian Economic Journal*).
883. ——— : Consumption projections of cereals and pulses in India during Third and Fourth Five-year plans (*Indian Population Bulletin*).
884. MAITRA, PRYTOOSH : Import substitution and changing import structure in Kenya (*First East Africa University, Social Science Conference, Kampala, Uganda, 1966*).
885. ——— : Import substitution potential in East Africa (*A Research Monograph* ; Oxford University Press, East Africa, Nairobi).
886. MAENDAR, H. : The role of management education in economic development (*Institute of Management Science, XIV International Meeting, Mexico City, August 1967*).
887. MUKHERJEE, M. : On the construction and use of inter-industry transaction tables in India (*Arthanijama*).
888. ——— : A note on the production function of household manufacturing enterprises (*Sankhya*).
887. ——— : The role of transactions in kind in developing economies (*International Association for Research in Income and Wealth, March 1967*).
890. ——— and CRATTERJEE, G. S. : Trends in the distribution of national income in India, 1950-51 to 1965-66 (*Conference Volume, Seminar on Preconditions for Socialist Advance in India, December 1968*).
891. ——— and ROY, B. : The role of labour in the post-independence growth of the Indian economy (*Conference Number, Labour Economic Journal, December 1968*).
892. PAL, M. N. : Regional demand projection for different commodities in India : 1970-71 and 1975-76 (*Indian Economic Journal*).
893. ——— (with Desai, P. B.) : Economic activity in the Kanpur region : present pattern and perspective dimension (*International Seminar on Urban and Industrial Growth of Kanpur Region, I.I.T., Kanpur*).
894. IYENGAR, N. S. : A study of differential price movements and consumer behaviour : an application of fractile graphical analysis (*Indian Economic Review*).
895. ——— : Some estimate of Engel elasticities based on National Sample Survey data (*Journal of the Royal Statistical Society*).
896. ——— and BHATTACHARYA, N. : Changes in the pattern of distribution of persons by monthly per capital total consumer expenditure over NSS rounds (*Studies on Consumer Behaviour*).
897. IYENGAR, N. S. (with Mukherjee, M.) : A note on the derivation of size distribution of personal household income from a given distribution of consumer expenditure (*Studies on Consumer Behaviour, Vol. 2*).
898. ROY, B. : Long-term trend of capital formation proportions in India : 1900-01 to 1950-51 (*Economic and Political Weekly*).
899. ——— and MUKHERJEE, M. : The role of labour in the post-independence growth of the Indian economy (*Conference Number, Labour Economic Journal, December 1968*).
9100. SIVASUBA, S. C. : Stock prices, dividends and earnings in India (*Sankhya*).
9101. WEISSKOPF, T. E. : A multisectoral programming model for India : some numerical results (*Economic and Political Weekly*).

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### K. Psychometry

- S102. CHATTERJEE, S. (with Mukherjee, M.): The development of a non-language test of verbal intelligence (*Journal of Psychological Researches*).
- S103. ——— (with Mukherjee, M.): Predictive ability of an aptitude tests battery used for differential prediction (*Journal of Vocational and Educational Guidance*).
- S104. CHATTERJEE, S. (with Mukherjee, M.): Factor study of an aptitude test battery used to differential prediction (*Psychol. Studies*).
- S105. DAS, RHEA S.: Prediction of individual performance in production and management (*Proc. Seminar on Behavioral Sciences in Management*. Indian Institute of Management, Calcutta, 2-5 August 1965).
- S106. ———: Some models for assessment of intelligence and scholastic attainment (*Journal of Psychological Researches*).
- S107. ———: The application of statistical sampling theory to educational evaluation (*Indian Psychological Review*).
- S108. ———: Selected paper (*Behavioral Sciences in Personnel Management* Ed. Srivastava, S., and De, N. R., Indian Institute of Management, Calcutta).
- S109. DAS, RHEA S. and MAHALANOBIS, P. C.: Some observations on educational evaluation by sampling universes of questions (*Sankhyā*).
- (S109) MAHALANOBIS, P. C. and DAS, RHEA S.: Some observations on educational evaluation by sampling universes of questions (*Sankhyā*).
- (S103) MUKHERJEE, M. (with Chatterjee, S.): Predictive ability of an aptitude test battery used for differential prediction (*Journal of Vocational and Educational Guidance*).
- (S104) MUKHERJEE, M. (with Chatterjee, S.): Factor study of an aptitude test battery used to differential prediction (*Psychol. Studies*).

### L. Sociology

- S110. BANDYOPADHYAY, S. (with Chattopadhyay, K.): Technological innovation and peoples' reaction (*Human Organisation*, USA).
- S111. ——— (with Chattopadhyay, K.): Displaced persons from East Pakistan: some findings on the social assimilation (*Bulletin, Cultural Research Institute*).
- S112. CHAKRAVARTI, P.: Some tenant families in Calcutta (*Indian Journal of Social Work*).

### M. Theoretical Physics

- S113. BANDYOPADHYAY, PRATUL: Internal quantum numbers and a unified model of Mesons and Baryons (*Progress of Theoretical Physics*, Japan).
- S114. ———: Configuration schemes for Hadronic resonances (*Progress of Theoretical Physics*, Japan).
- S115. ———: Some remarks on a model of weak interactions (*Progress of Theoretical Physics*, Japan).
- S116. ———: Possible weak interaction of photons and neutral Lepton currents (*The Physical Review*, USA).

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Annexure 6 : List of National Sample Survey Reports

6.1. PUBLISHED REPORTS

sr. no.	report no.	title
1.	103	Tables with Notes on Urban Labour Force (16th round : July 1960—June 1961)
2.	104	Tables with Notes on Consumer Expenditure (15th round : July 1959-June 1960).
3.	105	Tables with Notes on Household Non-mechanised Transport and Utilization of Working Animals. (15th round : July 1959-June 1960).
4.	106	Tables with Notes on Land Utilization Survey and Crop-cutting Experiments (17th round : July 1961-June 1962).
5.	107	Tables with Notes on Consumer Expenditure (11th and 12th rounds : August 1956-August 1957).
6.	108	Report on the Type Study on Consumption and Disposal of Cereals and Capital Formation by Households : 1959-60.
7.	109	Tables with Notes on Indian Villages (14th round : July 1959-June 1960).
8.	110	Tables with Notes on Rates of Birth, Death and Growth of Rural Population (16th round : July 1959-June 1960).
9.	111	Tables with Notes on Sample Survey of Manufacturing Industries 1958 : Factory Establishments : Detailed Result.
10.	112	Tables with Notes on the Results of Land Utilization Survey and Crop-cutting Experiments (18th round : July 1962-June 1963).

6.2. DRAFT REPORTS SUBMITTED TO THE GOVERNMENT OF INDIA

(The date of submission is given in brackets)

1.	132/2	Estimates of Birth and Death Rates and of the Rate of Growth of Population in the Rural Areas of India (8 August 1966).
2.	132/3	Estimates of Birth and Death Rates and of the Rate of Growth of Population in the Rural Areas of India (10 February 1967).
3.	137	Some Results of the Land Utilization Survey and Crop-cutting Experiments (1963-64) (22 April 1966).
4.	138	Tables with Notes on Indian Villages, Some Important Results (22 April 1966).
5.	139	Tables with Notes on Consumer Expenditure ( $P_1$ table) (3 May 1966).
6.	140	Tables with Notes on Some Aspects of Land-holdings in Rural Areas (State and All-India Estimates) (3 May 1966).
7.	141	Tables with Notes on the Annual Survey of Industries ( $P_1$ tables) 1963 (Sample Sector : Summary Results) (7 May 1966).
8.	142	Tables with Notes on Urban Labour Force (7 May 1966).
9.	143	Technical Paper on Sample Design.

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sr. no.	report no.	title
10.	144/1	Estimates of Annual Rates of Birth and Death and Rate of Growth of Population (sub-round 1 & 2 of Central Samples only) (12 September 1966).
11.	144/2	Estimates of Annual Rates of Birth and Death and of the Rate of Growth of Population (22 December 1966).
12.	144/3	Estimates of Annual Rates of Birth and Death and of the Rate of Growth of Population (22 December 1966).
13.	145	Tables with Notes on Consumer Expenditure (Preliminary—P <sub>1</sub> tables) (12 October 1966).
14.	146	Tables with Notes on Agricultural Holdings in Rural India (6 December 1966).
15.	147	Tables with Notes on Annual Survey of Industries 1964 (P <sub>1</sub> tables) : Sample Sector : Summary Results. (31 December 1966).
16.	148	Tables with Notes on Rural Employment and Unemployment (31 December 1966).
17.	149/1	Estimates of Annual Birth and Death Rates of Growth of Population (11 January 1967).
18.	150	Tables with Notes on Housing Condition (20 January 1967).
19.	151	Tables with Notes on Urban Labour Force (24 January 1967).
20.	152	Tables with Notes on Income of Rural Labour Households (31 January 1967).
21.	153	Tables with Notes on ASI 1960, Sample Sector : Detailed Results (P <sub>1</sub> tables) (31 January 1967).
22.	154/1	Tables with Notes on Consumer Expenditure (Some Preliminary Estimates) (17 February 1967).
23.	154/2	Tables with Notes on Consumer Expenditure (Some Preliminary Estimates) (27 February 1967).
24.	155	Report on Pilot Enquiry on Morbidity (27 February 1967).
25.	156	Differential Birth, Death and Infant Mortality Rates in Rural Households (28 February 1967).
26.	157	Tables with Notes on Indebtedness of Schedule Tribes : Households (7 March 1967).
27.	158/1	Tables with Notes on Consumer Expenditure (Some Preliminary Estimates) (14 March 1967).
28.	159	Tables with Notes on Professions and Liberal Arts (16 March 1967).
29.	160	Some Results of Land Utilization Survey and Crop-cutting Experiments (16 March 1967).
30.	161	Some Results of the Land Utilization Survey and Crop-cutting Experiments (21 March 1967).
31.	162	Tables with Notes on Annual Survey of Industries 1961 (27 March 1967).
32.	163	Tables with Notes on Internal Migration (Rural) (28 March 1967).
33.	164	Tables with Notes on Housing Condition (31 March 1967).

**Annexure 7 : Statement of Accounts, Auditors' Report and Audited  
Statement of Accounts, 1966-67.**

**AUDITORS' REPORT**

We report that we have audited the Balance Sheets as on 31st March 1967, signed by us under reference to this report, of

- (a) The Indian Statistical Institute, and
- (b) The "Other Funds" (items 9.1 to 9.8 of the Property and Assets side of the Balance Sheet of the Institute)

and relative Income and Expenditure Accounts for the year ended that date with the books and records maintained by the Institute and produced to us and the information and explanations given and, subject to and read with the notes thereon and also subject to the below-mentioned remarks, have found them to be in accordance therewith.

The remarks referred to above are :

(1) Values of fixed assets acquired on dates prior to 31st March 1962 were taken from those appearing in the Inventories prepared as on that date.

(2) The title deed in respect of land at Baroda (book value Rs. 27,611.32) was not available for our inspection. Further, we understand that the title deeds in respect of landed properties at Delhi, Madras, Bangalore and 102, Barrackpore Trunk Road, Calcutta (book value Rs. 9,05,095.42) have not yet been executed.

(3) Values of certain books and journals and also calculating, punching and other tabulating equipment amounting to Rs. 1,77,886.88 and Rs. 47,575.00 respectively [vide Schedule I (column 5.2)] annexed to the Institute's above stated Balance Sheet, although charged to the Institute's Income and Expenditure Account for the year, have been capitalised by crediting General Fund Account.

(4) We understand that the activities of the UNTAA Unit (i.e., the unit using the equipment received from United Nations Technical Assistance Administration) of the Institute have been discontinued during the year and the assets, received as gift and hitherto used by the Unit (i.e., other than those purchased by the Institute and appearing in the Institute's Balance Sheet as on 31st March 1966), were handed over to Garden Reach Workshops Ltd., the details of which were not available for our examination. We, however, understand that the relevant details are at present being prepared.

In the absence of the relevant records, we are unable to ascertain if all billings and other transactions relating to the Unit have properly been dealt with in the above accounts. We are also not aware if the Unit had any stock or work-in-progress as on 31st March 1967.

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(5) Out of stock of building materials Rs. 7,62,370.06 (Rs. 5,90,868.27 shown in the Balance Sheet of the Institute and Rs. 1,61,711.39 shown in Development Fund No. II Account Balance Sheet), items amounting to Rs. 1,64,100.88 have physically been verified by the Institute's officials as on 31st March 1967. In the absence of any physical verification by the Institute's officials of the other items (i.e., Iron and Steel materials, cement, blocks, Timber & Hard Board, Hardware, etc.) as on that date or in the recent past, the physical conditions and stock differences, if any, relating to these items are not known. Adjustments necessary in this regard have, therefore, not been ascertained and incorporated in these accounts.

(6) Rs. 49,58,317.55 being amount already claimed/to be claimed from the Government of India (item 5 of the Property and Assets side of the Institute's Balance Sheet) is considered good and recoverable by the Institute's officials at this stage. It has not, however, been possible for us to form an opinion in this regard from the information and explanations made available to us.

(7) Included in Suspense and Other Advances Rs. 5,10,863.49 (item 8.3 of the Property and Assets side of the Balance Sheet) are certain "on account" advances made to the employees/others, which have not been accounted for by them even after lapse of considerable time. Accordingly, necessary adjustments in respect of expenses, etc., against these advances have not been incorporated in these accounts and/or in the accounts for the appropriate years.

(8) Hospitality and Housing Committee Rs. 82,957.61 (item 8.1 of the Funds and Liabilities side of the Balance Sheet) and Canteen Imprest Rs. 29,865.97 (after writing off Rs. 21,250.00 to Workers' Welfare and Amenities Account in the Income and Expenditure Account of the Institute) included in Departmental Imprest (item 8.1 of the Property and Assets side of the Balance Sheet) respectively represent :-

- (a) net amount due to the Committee in respect of services rendered to the Guests and Officials of the Institute,
- (b) net advances to the Canteen, which we are informed, will be written off in the subsequent years.

Following the previous years' practice, other transactions (including revenue deficit and/or surplus, if any) relating to the above Committee/Canteen, have not been included in the Institute's Account.

(9) Furthermore, in accordance with the consistent practice, transactions in respect of the ISI Small Scale Industries Experimental Unit have not been included in the Institute's Accounts. In the Balance Sheet as at 31st March 1967 of the Supervision Fee Fund, a sum of Rs. 11,490.36 being net balance of advances made by the Fund to the Unit upto that date, however, has been shown as "Amount due on Loan Account from ISI Small Scale Industries Experimental Unit".

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(10) Included in "other liabilities" (item 8.6 of the Funds and Liabilities side of the Institute's Balance Sheet) is a sum of Rs. 3,190.37 which is arrived at as follows :-

Due to an official of the Bombay Branch (NSS)			
of the Institute	...	...	...
			Rs. 8,594.81
Less : Cash in hand	...	...	...
			Rs. 388.79
Balance with Bank (Bank of India Ltd.)			
—the relevant Bank statements for the			
year 1966-67 are not available for our			
examination	...	...	...
			5,016.65
			<u>5,404.44</u>
			Rs. 3,190.37
			<u>          </u>

Calcutta  
6th October, 1967.

PRICE WATERHOUSE, PEAT & Co.  
Chartered Accountants

INDIAN STATISTICAL INSTITUTE

BALANCE SHEET

1956 Rs. P.	Funds and Liabilities	Rs. P.	Rs. P.
	<b>1. GENERAL FUND :</b>		
1,16,63,750.49	As per Schedule VIII enclosed .. .. .		1,82,07,596.58
	<b>2. OTHER FUNDS : (excluding Director's (Trust) Fund and Indian Statistical Institute General Provident Fund) As per Separate Balance Sheet enclosed as per contra :</b>		
	1. Visiting Professors and Fellows Fund .. .. .	119.18	
	2. Leave Salary Fund .. .. .	79,063.22	
	3. Gratuity Fund .. .. .	26,31,264.07	
	4. Development Fund I .. .. .	1,16,521.94	
	5. Development Fund II .. .. .	12,80,794.91	
42,33,623.65	6. Supervision Fee Fund .. .. .	2,16,304.87	42,37,052.14
	<b>3. LOAN FROM OTHER FUNDS :</b>		
17,50,000.00	As per Schedule IX enclosed .. .. .		37,35,000.00
	<b>4. OVERDRAFT FROM STATE BANK OF INDIA, SHAMBAZAR SECURED AGAINST CERTAIN G.P. NOTES OF I.S.I. GENERAL PROVIDENT FUND AND G.P. NOTES OF DIRECTOR'S (TRUST) FUND AND DEVELOPMENT FUND II .. .. .</b>		—
12,88,022.54			
	<b>5. CASH CREDIT ADVANCE FROM STATE BANK OF INDIA, SHAMBAZAR (GUARANTEED BY GOVERNMENT OF INDIA) .. .. .</b>		5,00,000.00
18,50,000.00			
	<b>6. ADVANCE FROM GOVERNMENT OF INDIA FOR NSS WORK</b>		
15,00,000.00	As per last account .. .. .		18,00,000.00
	<b>7. ROCKEFELLER FOUNDATION GRANT : as per contra</b>		
	As per last account .. .. .	11,659.00	
11,659.00	Less : expenditure during the year .. .. .	9,469.21	2,189.79
	<b>8. DEPOSITS AND OTHER LIABILITIES :</b>		
	1. Hospitality and House Committee .. .. .	82,967.61	
	2. Staff income-tax and annuity deposits .. .. .	34,468.89	
	3. Library and other deposits .. .. .	29,057.27	
	4. Staff insurance, co-operative society, B.W. Housing Scheme etc. .. .. .	13,168.33	
	5. Director of Health Services for purchasing Census Report .. .. .	8,128.00	
36,20,287.69	6. Other liabilities .. .. .	12,42,024.61	16,10,702.71
<u>1,99,28,343.37</u>	Carried over : .. .. .		<u>2,48,92,641.20</u>



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AS AT 31st MARCH 1967

1966 Rs. P.	Property and Assets	Rs. P.	Rs. P.
	1. FIXED ASSETS :		
1,18,00,256.53	As per Schedule I enclosed .. .. .		1,33,16,098.58
	2. RENTAL OF TELEPHONE UNDER GOVT SCHEME : (INCLUDING INSTALLATION CHARGES)		
	Capital Grant Account		
	As per last account .. .. .	21,891.50	
	Less : written off during the year @ 5% .. .. .	1,064.08	
		20,217.42	
31,581.50	Add : payments during the year .. .. .	4,167.00	24,354.42
	3. ADVANCE ON ACCOUNT OF ISIJU EXPENDITURE ON JOINT PROJECT FOR THE CONSTRUCTION OF ELECTRONIC COMPUTERS IN PROGRESS (EX- CLUDING VALUE OF FURNITURE, EQUIPMENT ETC. LOANED TO ISIJU WHICH ARE INCLUDED IN SCHEDULE I)		
	As per last account .. .. .	4,87,723.82	
4,87,723.82	Add : during the year .. .. .	26,040.00	5,12,763.82
	4. RECOVERABLE CAPITAL OUTLAY: DOUBTFUL		
	As per last account .. .. .	20,949.84	
20,949.84	Less : recovered during the year .. .. .	4,717.28	16,232.56
	5. AMOUNT CLAIMED/TO BE CLAIMED FROM GOV. ERNMENT OF INDIA : (EXCLUDING Rs. 2,64,147.21 INCLUDED IN ITEM 6 BELOW)		
	1. Amount already claimed but pending acceptance As per Schedule II enclosed .. .. .	39,13,982.16	
	2. Amount to be claimed as per Schedule III enclosed .. .. .	3,62,829.90	
		42,83,612.06	
	3. Amount claimed and rejected (but under correspon- dence):		
	As per Schedules IV enclosed .. .. .	8,74,705.53	
86,59,164.59	4. Amount not at all claimed .. .. .	—	49,58,317.59
	6. EXCESS OF EXPENDITURE OVER RECEIPTS IN RESPECT OF MISCELLANEOUS PROJECTS AND ACTIVITIES ON BEHALF OF THE GOVERNMENT OF INDIA AND OTHER BODIES :		
2,16,938.86	As per Schedule V enclosed .. .. .		2,77,906.80
5,56,405.67	7. STORES (BUILDING MATERIALS ETC.) AT COST		5,90,868.27
2,17,92,719.43	Carried over : .. .. .		1,96,06,368.86

INDIAN STATISTICAL INSTITUTE

BALANCE SHEET

1966 Ra. P.	Funds and Liabilities	Ra. P.	Ra. P.
2,89,26,543.37	Brought Forward .. .. .		2,46,82,641.20
	<b>8. EXCESS OF INCOME OVER EXPENDITURE FOR THE YEAR 1965-66:</b>		
	As per last account—		
	i) NSS Project Sector ..	4,31,654.65	
	ii) Non-project Sectors .. .. .	3,91,388.16	7,13,060.81
	<i>Less:</i> (i) adjustment against amount claimed from Government of India in respect of NSS partly processed work (see Schedule II item 3.6)	6,00,000.00	
	(ii) adjustment against grant from Government of India for the Non-Project Sectors for current year .. .. .	2,18,050.81	7,13,060.81
7,13,060.81			—
	<b>10. EXCESS OF INCOME OVER EXPENDITURE IN RESPECT OF MISCELLANEOUS PROJECTS AND ACTIVITIES ON BEHALF OF THE GOVERNMENT OF INDIA AND OTHER BODIES:</b>		
(-) 32,872.38	As per Schedule X enclosed .. .. .		18,562.33
	<b>11. AMOUNT DUE TO ELECTRONIC DATA PROCESSING AND COMPUTATION UNIT ON LOAN ACCOUNT:</b>		
4,36,667.05	As per separate balance sheet of the unit enclosed. .... .		8,62,109.33
2,70,33,488.85			2,55,54,399.89

- NOTES: (a) In accordance with the terms and conditions of the Grants for Capital Expenditure received from the Government of India, the Institute shall not sell or otherwise dispose of or mortgage any property acquired by it with such grants without prior approval of the Government. Most of the assets have been acquired out of the Government Grants, total written down value of which, however, are not readily ascertainable.
- (b) Cash balances in hand include balance with International House of Japan, Translation Unit in Tokyo amounting to Ra. 9,162.90 being Japanese Yen 687809 converted at pre-devaluation rate of exchange (Ra. 100 @ yen 7500 approximately).
- (c) Transactions in respect of Electronic Data Processing and Computation Unit of the Institute have not been incorporated in these accounts. These are set out in the separate Balance Sheet as at 31st March 1967 and the Income and Expenditure Account of the Unit enclosed.
- (d) Comparative figures, have, wherever necessary, been re-arranged.
- (e) The Institute has guaranteed that in the event of the recognition of the Indian Statistical Institute General Provident Fund by the Commissioner of Income Tax, West Bengal, it not given the Institute will be responsible for any additional income tax which may be payable in this regard.

Calcutta,  
8th October 1967

S. P. Mukherjee  
Senior Accounts Officer

P. Ray  
Joint Secretary

THIRTY-FIFTH ANNUAL REPORT: 1966-67

AS AT 31st MARCH 1967—Contd.

1966		Property and Assets		Ra. P.	
Ra.	P.			Ra.	P.
2,17,92,719.53		Brought Forward .. .. .			1,96,96,368.86
<b>8. LOANS AND ADVANCES:</b>					
		.1 Departmental Imprint .. .. .		28,512.40	
		.2 Festival advance to workers .. .. .		2,331.35	
		.3 Suspense and other advances .. .. .		5,10,863.49	
		.4 Educational loan and other loans .. .. .		17,022.04	
		.5 Security Deposit .. .. .		23,160.30	
		.6 Advance to Bankhya Yatra (P) Ltd. (In Liquidation)—Considered Irrecoverable .. .. .		10,424.00	
		.7 Sundry debtors (Partly Irrecoverable) .. .. .		1,03,081.17	
		.8 Advance for purchase of land .. .. .		51,332.41	
5,87,418.24		.9 Charges prepaid .. .. .		8,995.50	7,66,712.96
<b>9. ASSETS OF OTHER FUNDS: (EXCLUDING DIRECTOR'S (TRUST) FUND AND INDIAN STATISTICAL INSTITUTE GENERAL PROVIDENT FUND): As per SEPERATE BALANCE SHEETS ENCLOSED</b>					
As per Contra.:					
		.1 Visiting Professors and Fellows Fund .. .. .		115.18	
		.2 Leave Salary Fund .. .. .		79,063.22	
		.3 Gratuity Fund .. .. .		25,31,264.07	
		.4 Development Fund I .. .. .		1,19,521.94	
		.5 Development Fund II .. .. .		12,80,794.91	
48,33,633.85		.6 Supervision Fee Fund .. .. .		2,16,304.87	48,27,069.14
<b>10. CASH BALANCES:</b>					
		.1 In hand (excluding Ra. 1,93,910.75 in respect of other Funds) As per schedule VI enclosed .. .. .		10,729.25	
		.2 At Bank: On current Account:			
		i) With American Express Co. Inc., Calcutta for Rockefeller Foundation Grant As per contra .. .. .		2,189.79	
		ii) With other Banks as per Schedule VII enclosed .. .. .	8,82,342.86	8,54,532.65	8,65,261.90
3,19,727.45					
<u>2,70,33,498.86</u>					<u>2,55,54,395.86</u>

This is the Balance Sheet referred to in our report of even date

PRICE WATERHOUSE, FRANK & CO.  
Chartered Accountants

INDIAN STATISTICAL INSTITUTE

INCOME AND EXPENDITURE ACCOUNT

1968	Expenditure	Plan	Non-Plan
Rs. P.		Rs. P.	Rs. P.
81,09,528.83	1. To Salary and remuneration to teachers etc. ..	2,44,623.63	65,07,661.40
	.1 .. Dearness allowance .. .. .	7,894.46	31,48,356.65
7,45,606.41	.2 .. House rent allowance .. .. .	2,652.93	7,86,144.67
4,29,673.96	.3 .. City compensatory allowance .. .. .	2,201.41	4,31,561.87
5,15,766.30	.4 .. Employer's contribution to Workers' Provident Fund .. .. .		6,15,000.87
2,39,759.94	.5 .. Reimbursement of medical expenses .. .. .		4,19,672.06
4,53,488.46	2. .. Travelling expenses .. .. .	5,943.46	4,40,870.88
2,44,759.43	3. .. Overtime allowance .. .. .		2,79,218.49
60,029.90	4. .. Payment for leave vacancies .. .. .		34,731.48
1,26,361.60	5. .. Visiting Professors, foreign scientists, fellows and experts .. .. .	17,247.39	1,26,497.35
4,11,685.60	6. .. Scholarships, stipends and other assistance to trainees .. .. .	9,944.38	5,32,674.64
5,927.93	7. .. Prizes to workers for initiative .. .. .		8,014.00
3,10,441.37	8. .. Contribution to Gratuity Fund .. .. .		3,09,602.41
	9. .. Machine Tabulation expenses :		
	.1 .. Hire and maintenance of tabulating equipment, punches and verifying machines etc. including service charges and freight, customs and other charges for new machines (see note (1) below) ..	1,63,841.98	15,31,297.88
14,82,271.18	.3 .. Cost of cards and cabinets, stores and stationeries etc. .. .. .		1,26,296.32
1,60,424.48	.3 .. Payment to Army Statistical Organization .. .. .		2,600.00
65,122.14	10. .. Printing and publication .. .. .	881.98	74,429.99
31,215.11	11.1 .. Society type activities (Entertainment and Conference Expenses etc.) .. .. .	10,097.07	60,069.44
22,764.97	.3 .. Examination expenses .. .. .		27,249.99
1,46,013.61	12.1 .. Books and journals (including cost of binding etc.) .. .. .	1,442.88	1,85,806.47
12,932.30	.2 .. Microfilm, photo and audiography expenses .. .. .		10,381.16
8,326.92	13. .. Expenses of Translation Units in Japan .. .. .		748.40
63,241.26	14. .. Repairs, replacement and maintenance of office equipment, furniture and accessories .. .. .	193.00	1,46,462.72
1,56,324.01	15.1 .. Stationeries and consumable stores .. .. .	5,843.63	1,82,748.72
	.3 .. Other miscellaneous expenses viz., advertisement, insurance premia, law charges, coolies, cartage, conveyance and other petty expenses like hot weather contingencies etc. (including cost of Air-Conditioners 6,167.66) .. .. .	696.10	1,28,942.99
1,32,615.26			
1,40,48,370.08	Carried over : .. .. .	4,74,614.19	1,48,18,939.13

THIRTY-FIFTH ANNUAL REPORT: 1966-67

FOR THE YEAR ENDED 31st MARCH 1967

1966 Ra. P.	Income	Plan Ra. P.	Non-Plan Ra. P.
	1. By Grants-in-aid from Government of India for Non-Project Sectors (including Ra. 2,13,980.81 being adjustment in respect of excess of income over expenditure for the previous year)		
36,60,000.00	.1 Research and Training School including Computing Machine and Electronic Laboratory .. ..		35,78,666.81
11,50,000.00	.2 .. Planning Division .. ..		13,39,608.00
7,10,000.00	.3 .. Statistical Quality Control .. ..		7,85,795.00
1,82,000.00	.4 .. International Statistical Education Centre .. ..	2,85,000.00	2,04,588.00
6,50,000.00	.5 .. Utilisation and maintenance of Soviet equipment (UNTAA) .. ..		3,160.00
90,88,000.00	2. .. Grants-in-aid from Government of India for NSS Project Sector (including Ra. 2,600/- received for payment to Army Statistical Organisation) .. ..	2,10,000.00	91,16,232.00
49,470.00	3. .. Amount received from Government of India, Planning Commission for Income Distribution Committee work done by NSS .. ..		—
	4. .. Receipts from Non-Governmental Sources :		
	.1 .. In respect of SQC :		
5,54,030.49	a) .. Membership fees, training fees, service charges etc. ..		5,52,707.15
	.2 .. In respect of RTS :		
4,853.67	a) .. Membership subscription .. ..		6,263.68
22,068.68	b) .. Fees for training course and sale proceeds of syllabus etc.		28,194.54
15,022.70	c) .. Examination fees and other receipts .. ..		10,056.61
7,478.07	d) .. Receipts from produce at Giridih experimental farm etc.		8,277.67
8,301.74	e) .. Service charges for work done by Psychometric Unit ..		8,135.00
	.3 .. In respect of UNTAA : (including Development Workshop)		
1,45,600.23	a) .. Service charges .. ..		94,368.12
	6. .. Grants for Miscellaneous Projects :		
40,050.50	.1 .. From Director of Health Services, Government of India for Family Planning Survey .. ..		1,38,600.00
20,000.00	.2 .. From Tata Institute of Social Sciences for Sociology of Education Research Project .. ..		—
—	.3 .. From Asia Foundation for International Conference on Comparative Research in Social Change and Regional Disparities .. ..		23,730.00
	6. .. Miscellaneous receipts :		
378.75	.1 .. Library .. ..		391.30
328.50	.2 .. Appraisal .. ..		—
1,83,07,976.31	Carried over .. ..	4,75,000.00	165,91,742.88

INDIAN STATISTICAL INSTITUTE

INCOME AND EXPENDITURE ACCOUNT

1966 Ra. P.	Expenditure	Ra. P.	Plan Ra. P.	Non-Plan Ra. P.
1,40,48,270.03	Brought Forward .. .. .		4,74,614.19	1,48,12,939.19
	18. To Other non-salary contingencies :			
2,89,839.34	.. 1 .. Postal and M.O. charges, air and railway freight, electricity and telephone charges .. .. .		889.22	3,34,027.56
	.. 2 .. Audit fees and expenses .. .. .	16,000.00		
16,240.00	Less : written back (previous year's provision) .. .. .	5,540.00		6,460.00
5,67,718.71	.. 3 .. Bank charges and interest .. .. .			1,84,048.35
2,31,261.17	17.1 .. Rent, rates and taxes (including those of field, camps and out-station offices) .. .. .			2,81,166.04
2,37,368.25	.. 3 .. Repair and/or maintenance of buildings, land etc. and petty construction .. .. .		126.76	2,75,880.64
1,00,078.19	18. .. Transport .. .. .			1,06,880.52
1,48,860.12	19. .. Workmen welfare and amenities (excluding re- imbursement of medical expenses) .. .. .			78,044.28
—	20. .. Provision for Director's discretionary expenses .. .. .			10,000.00
58,340.20	21.1 .. Laboratory and Workshop Stores, tools and minor accessories etc. .. .. .			60,839.58
23,744.09	.. 2 .. Material and other charges for experimental farming on rice research scheme .. .. .			9,139.90
5,87,466.31	22. .. Excess of income over expenditure .. .. .			—
<u>1,83,07,975.31</u>			<u>4,76,630.14</u>	<u>1,61,42,215.88</u>

- NOTES: 1. As stated in the Balance Sheet this account does not include transactions in respect of Electronic Data Processing and Computation Unit of the Institute, a separate set of accounts in respect of which is annexed. Included under the head "Hire and Maintenance of Tabulating Equipment, Punches and Verifying machines, etc." is an amount of Rs. 6,26,639.00 charged by the Electronic Data Processing and Computation Unit of the Institute for work done by it.
2. This account does not include the transactions in respect of International Statistical Education Centre Colombo Plan Fellowship, net effect of which has been given in the Balance Sheet. (Vide Schedule V enclosed).
3. An amount of Rs. 6,47,789.54 being depreciation on fixed assets and O.Y.T. telephone has been adjusted in General Fund.
4. In accordance with consistent practice, the cost of cards, cabinets, stationeries and stores etc., have been written off in this account and any stocks in hand as on 31st March 1967 have not been treated as assets in the Balance Sheet.
5. In accordance with the previous practice, certain transactions have been included in these accounts on a Cash basis.

Calcutta  
6th October, 1967

S. P. Mukherjee  
Senior Accounts Officer

P. Roy  
Joint Secretary

THIRTY-FIFTH ANNUAL REPORT: 1966-67

FOR THE YEAR ENDED 31st MARCH 1967--contd.

1966		Income			Plan		Non-plan	
No.	P.				No.	P.	No.	P.
1,63,07,975.31		Brought forward	..	..	..	4,75,000.00	1,68,91,743.88	
—		7. By Excess of expenditure over income allocated to Sectors as per Schedule XI enclosed	..	..	..	630.16	2,50,473.10	

1,63,07,975.31

4,75,630.16

1,61,42,216.98

PRINCE WATSONS, PRAT & Co.  
Chartered Accountants

INDIAN STATISTICAL INSTITUTE

SCHEDULE I

PARTICULARS OF FIXED ASSETS

Particulars	Written down value as on 31st March, 1966	Depreciation for the year as shown in column (2)	
		rate	amount
(1)	(2)	(3.0)	(3.1)
	Ra. P.		R. P.
<b>A. LAND AND LAND DEVELOPMENT:</b>			
1. Calcutta:			
.1 At 153 Gopal Lal Tagore Road (adjoining to 203 Barrackpore Trunk Road) .. .. .	65,546.80	—	—
.2 Development of the above land .. .. .	32,838.65	—	—
.3 At 205 Barrackpore Trunk Road (including cost of development) .. .. .	4,33,686.27	—	—
.4 At 155, 160, 165, 166/1, Gopal Lal Tagore Road .. .. .	96,663.71	—	—
.5 Development of above land .. .. .	6,618.51	—	—
.6 At 102 Barrackpore Trunk Road (Title not yet vested in the Institute) .. .. .	5,30,564.00	—	—
.7 At 208 Barrackpore Trunk Road (out of the initial payment of Ra. 14,44,523.00, Ra. 1,09,867.72 and Ra. 11,150.87 transferred to Buildings and Sheds respectively) .. .. .	—	—	—
.8 At 202 Barrackpore Trunk Road .. .. .	5,70,911.87	—	—
2. Giridih:			
.1 Farm land (Note (a) below) .. .. .	9,514.51	—	—
.2 Development and fencing etc. .. .. .	29,689.55	—	—
.3 Farming development .. .. .	10,682.00	—	—
.4 Irrigation and water supply .. .. .	25,810.00	—	—
.5 In village 'Makaspur', Giridih .. .. .	1,30,087.90	—	—
.6 Purchased from Sm. Prakriti Devi Gangopadhyaya .. .. .	14,000.00	—	—
3. Delhi (lease hold) .. .. .	4,00,000.00	—	—
4. Baroda .. .. .	27,611.32	—	—
5. Bangalore .. .. .	1,52,918.92	—	—
6. Madras .. .. .	21,612.50	—	—
7. Hyderabad .. .. .	1,14,385.00	—	—
Sub-total: (A1-7) .. .. .	34,72,940.81	—	—
<b>B. BUILDINGS:</b>			
1. Calcutta:			
.1 Partly at 203 Barrackpore Trunk Road and partly at 153 Gopal Lal Tagore Road (Main building) (Note (b) below) .. .. .	9,06,748.57	2.5%	22,665.72
.2 At 153 Gopal Lal Tagore Road .. .. .	11,21,990.84	2.5%	28,049.93
.3 At 205 Barrackpore Trunk Road .. .. .	17,84,316.19	2.5%	44,607.90
.4 At 206 Barrackpore Trunk Road .. .. .	—	—	—
.5 At 202 Barrackpore Trunk Road .. .. .	46,232.00	2.5%	1,154.80
Sub-total: (B1.1-1.5) .. .. .	38,55,287.60	—	96,482.34



THIRTY-FIFTH ANNUAL REPORT : 1966-67

As on 31st March 1967

Total	Additions during the year			Total	Written down value as on 31st March 1967
	Out of capital Expenditure grant	Out of Rockefeller Foundation grant	Out of current Expenditure grant		
(4)	(5.0)	(6.1)	(6.2)	(6.3)	(6)
Ra. P.	Ra. P.	Ra. P.	Ra. P.	Ra. P.	Ra. P.
65,545.90	—	—	—	—	65,545.90
33,838.86	7,686.11	—	—	7,686.11	40,624.76
4,33,886.27	—	—	—	—	4,33,886.27
96,863.71	—	—	—	—	96,863.71
8,618.61	—	—	—	—	8,618.61
3,30,664.00	—	—	—	—	3,30,664.00
—	13,23,274.41	—	—	13,23,274.41	13,23,274.41
6,70,911.87	—	—	—	—	6,70,911.87
9,614.61	—	—	—	—	9,614.61
29,889.85	—	—	—	—	29,889.85
10,882.00	—	—	—	—	10,882.00
26,610.00	—	—	—	—	26,610.00
1,30,087.90	—	—	—	—	1,30,087.90
14,000.00	—	—	—	—	14,000.00
4,00,000.00	—	—	—	—	4,00,000.00
27,611.32	—	—	—	—	27,611.32
1,62,918.92	—	—	—	—	1,62,918.92
21,612.60	—	—	—	—	21,612.60
1,14,385.00	—	—	—	—	1,14,385.00
24,72,940.61	13,30,960.62	—	—	13,30,960.62	38,03,901.13
8,84,079.86	6,191.76	—	—	6,191.76	271.00
10,93,946.92	61,608.32	—	—	61,608.32	11,55,465.24
17,39,708.29	86,202.70	—	—	86,202.70	18,24,910.99
—	1,21,344.30	—	—	1,21,344.30	1,21,344.30
46,076.20	—	—	—	—	46,076.20
27,62,811.26	2,74,247.07	—	—	2,74,247.07	40,37,068.33

INDIAN STATISTICAL INSTITUTE

SCHEDULE

PARTICULARS OF FIXED ASSETS

Particulars	Written down value as on 31st March, 1966	Depreciation for the year on column (2)	
		rate	amount
(1)	(2)	(3.0)	(3.1)
	Ra. P.		Ra. P.
<b>C. SHEDS &amp; STRUCTURES :</b>			
1. Calcutta :			
.1 At 203 Barrackpore Trunk Road and 153 Gopal Lal Tagore Road [Note (b) below] .. .. .	1,07,162.40	7.6%	8,037.18
.2 At 206 Barrackpore Trunk Road .. .. .	99,880.10	7.5%	7,478.00
.3 At 156 166, 165 & 166/1, Gopal Lal Tagore Road .. .. .	83,766.24	7.5%	4,782.47
.4 At 206 Barrackpore Trunk Road .. .. .	—	—	—
.5 At 202 Barrackpore Trunk Road .. .. .	3,70,682.39	7.5%	20,262.68
.6 At 5 Rabindra Nath Tagore Road, for UNTAA Workshop (Situated on rented premises) .. .. .	3,71,811.02	7.5%	27,886.83
2. Delhi :			
.1 Partitions, structures etc. at Delhi .. .. .	2,064.11	7.5%	154.81
.2 Erection of a Nissan bus .. .. .	1,818.52	7.5%	121.29
Sub-total (C1.1—2.2) .. .. .	9,16,884.78	—	68,761.36
<b>D. MACHINERY &amp; EQUIPMENT :</b>			
1. Calculating, Punching & other tabulating equipment .. .. .	5,34,042.73	15%	80,106.42
2. Office machinery & equipment .. .. .	2,69,721.60	15%	40,458.22
3. Workshop equipment .. .. .	80,761.93	15%	12,112.79
4. Photo & optical equipment .. .. .	10,838.55	15%	1,625.77
5. Laboratory equipment .. .. .	5,37,363.15	15%	96,004.47
6. Printing Press, Monotype accessories etc. .. .. .	8,022.76	15%	1,204.81
7. Construction equipment .. .. .	24,954.37	15%	3,743.18
8. UNTAA Workshop machinery & equipment .. .. .	83,197.33	15%	12,479.60
9. Electronic Computers (HEC 2M) and other Tabulating equipment .. .. .	1,01,978.08	15%	15,296.40
Sub-total (D1—9) .. .. .	17,60,878.40	—	2,82,601.74
<b>E. PASSENGER LIPT:</b> .. .. .	16,083.45	10%	1,608.35
<b>F. ELECTRICAL EQUIPMENT AND INSTALLATION :</b>			
1. High tension electricity .. .. .	64,240.52	10%	6,424.06
2. Electrical equipment and fittings .. .. .	3,26,732.23	10%	33,673.23
3. High tension electricity for UNTAA Workshop .. .. .	79,755.88	10%	7,975.59
Sub-total (F1—3) .. .. .	4,60,728.61	—	46,072.89

THIRTY-FIFTH ANNUAL REPORT : 1966-67

I—Contd.

as on 31st March 1967

Total	Additions during the year			Total	Written down value as on 31st March 1967
	Out of Capital Expenditure grant	Out of Rockefeller Foundation grant	Out of Current Expenditure grant		
(4)	(5.0)	(5.1)	(5.2)	(5.3)	(6)
Rs. P.	Rs. P.	Rs. P.	Rs. P.	Rs. P.	Rs. P.
90,135.32	—	—	—	—	90,135.32
92,304.10	—	—	—	—	92,304.10
50,083.77	800.53	—	—	800.53	50,264.69
—	11,160.87	—	—	11,160.87	11,160.87
2,50,288.71	66,240.32	—	—	66,240.32	2,16,629.03
2,43,926.19	4,340.00	—	—	4,340.00	2,48,266.19
1,909.30	—	—	—	—	1,909.30
1,497.13	—	—	—	—	1,497.13
8,47,933.42	82,112.11	—	—	82,112.11	9,30,045.53
4,53,836.81	49,308.20	[Note (d) below]	47,675.00	96,944.30	5,50,880.61
2,26,863.28	9,439.31	—	—	9,439.31	2,38,702.69
68,639.14	—	—	—	—	68,639.14
9,042.78	—	—	—	—	9,042.78
5,41,768.68	22,760.99	9,469.51	—	32,220.50	5,78,978.88
6,827.86	—	—	—	—	6,827.86
21,211.21	—	—	—	—	21,211.21
70,717.72	—	—	—	—	70,717.72
86,679.68	—	—	—	—	86,679.68
14,88,076.66	81,659.60	9,469.21	47,675.00	1,38,603.81	16,26,680.47
13,676.10	—	—	—	—	13,676.10
48,816.47	—	—	—	—	48,816.47
2,94,068.96	86,328.96	—	—	86,328.96	3,29,287.93
71,780.27	—	—	—	—	71,780.27
4,14,666.72	86,328.96	—	—	86,328.96	4,49,864.67

(Contd.)

INDIAN STATISTICAL INSTITUTE

SCHEDULE

PARTICULARS OF FIXED ASSETS

Particulars	Written down value as on 31st March, 1966	Depreciation for the year on column (2)	
		rate	amount
(1)	(2)	(3.0)	(3.1)
	Rs. P.		Rs. P.
G. FURNITURE & FITTINGS .. .. .	8,88,398.42	10%	88,839.87
H. BOOKS & JOURNALS .. .. .	14,78,670.70	5%	73,928.54
I. MOTOR CARS & VEHICLES .. .. .	1,14,906.79	20%	22,981.75
J. LIBRARY EQUIPMENT (INCLUDING EQUIPMENT PRO- CURED THROUGH FORD FOUNDATION GRANT AND ROCKEFELLER FOUNDATION GRANT) .. .. .	30,948.09	16%	4,942.21
K. CONSTRUCTION OF OVERBRIDGE .. .. .	11,024.08	7.5%	826.81
GRAND TOTAL: .. .. .	1,18,00,956.53	—	6,46,735.86

Notes :

<sup>(a)</sup> Excluding Rs. 14,861.18 paid out of Supervision Fee Fund and included in the accounts of that Fund.

<sup>(b)</sup> Situated partly on land, the value of which amounting to Rs. 97,656.96 has been included in Supervision Fee Fund Account.

<sup>(c)</sup> Net after adjustment of Rs. 10,830/- in respect of previous year.

<sup>(d)</sup> Net after adjustment of Rs. 2062/- in respect of previous year.

S. P. Mukherjee  
Senior Accounts Officer

THIRTY-FIFTH ANNUAL REPORT : 1966-67

I (Contd.)

as on 31st March 1967

Total	Additions during the year			Total	Written down value as on 31st March 1967
	Out of Capital Expenditure grant	Out of Rockefeller Foundation grant	Out of Current Expenditure grant		
(4)	(5.0)	(5.1)	(5.2)	(5.3)	(6)
R. P. 8,20,468.65	Ra. P. 92,758.28 Note (d) below.	Ra. P. —	Ra. P. —	Ra. P. 92,758.28	Ra. P. 7,13,214.83
14,04,642.16	80,850.59	—	1,77,838.88	2,08,687.17	18,13,209.33
91,924.04	—	—	—	—	91,924.04
25,305.88	—	—	—	—	25,305.88
10,197.27	—	—	—	—	10,197.27
1,11,63,530.67	19,27,644.82	9,469.21	2,26,461.88	21,62,676.91	1,33,18,096.88

P. Roy  
Joint Secretary

INDIAN STATISTICAL INSTITUTE

SCHEDULE II

AMOUNT ALREADY CLAIMED FROM GOVERNMENT OF INDIA BUT PENDING ACCEPTANCE AS ON 31st MARCH 1967

Particulars		Rs.	P.	Rs.	P.
<b>1. On account of Capital expenditure :</b>					
Excess of expenditure over receipt of grant—					
As per last account					
.1	1961-62 and 1962-63 .. .. .			2,00,357.01	
.3	1963-64 .. .. .			1,40,999.48	
.3	1964-65 .. .. .			80,072.18	
.4	1965-66 .. .. .			38.90	
	Less : claim foregone during the year .. .. .			38.90	
.5	In respect of 202 Barrackpore Trunk Road for repair, renovations etc. :				
	As per last account .. .. .			2,17,703.07	6,18,931.70
<b>2. On account of Non-Project Sectors :</b>					
Excess of expenditure over income :					
As per last account .. .. .					
.1	Upto 1959-60 .. .. .			2,25,727.00	
.2	1960-61 .. .. .			1,84,517.00	
.3	1962-63 (including UNTAA sector) .. .. .			3,81,144.00	7,91,388.00
<b>3. On account of NSS Project Sector (without taking into account Rs. 15,00,000.00 cash advance from Government of India shown under Liabilities side of the Balance Sheet)</b>					
Excess of expenditure over income :					
As per last account .. .. .					
.1	Upto 1958-59 .. .. .			5,44,011.00	
.3	For 1963-64 (contract period) :	13,29,208.00			
	Less : amount received during the year for Income Distribution Committee Work .. .. .			16,240.00	13,13,968.00
.3	For 1964-65 as per last account .. .. .			37,654.74	
	Add : NSS S-busule printing :			47,851.72	
	As per last account .. .. .				
				85,506.46	
	Less : amount received during the year for Income Distribution Committee Work .. .. .			84,200.00	1,308.46
.4	In respect of delivery of end products and end results :				
	As per last account .. .. .	7,00,886.00			
	Less : amount claimed from Government of India and rejected (but under correspondence)—shown separately in Balance Sheet .. .. .			2,00,000.00	5,00,886.00
.5	In respect of value of partly processed NSS work :				
	As per last account .. .. .			41,40,143.00	
	Less : i) amount adjusted against excess of income over expenditure for the year 1965-66 (See Funds and Liabilities side of the Balance Sheet) 5,00,000.00				
	ii) amount received from Government of India during the year 35,00,000.00	40,00,000.00		1,40,143.00	34,99,113.46
<b>4. On account of 25th Anniversary of the Institute :</b>					
Excess of expenditure over receipt :					
	As per last account .. .. .				4,550.00
					38,13,682.18

S. P. Mukherjee  
Senior Accounts Officer

P. Roy  
Joint Secretary

## THIRTY-FIFTH ANNUAL REPORT : 1966-67

## SCHEDULE III

AMOUNT TO BE CLAIMED FROM GOVERNMENT OF INDIA AS ON 31st MARCH 1967

Particulars	Rs.	P.	Rs.	P.	Rs.	P.
1. On account of Revenues (Current) Expenditure for 1966-67 (excluding Miscellaneous Projects)						
Excess expenditure over income in UNTAA Sector :				3,32,041.81		
Less : Savings in—						
a) Non-Project Sectors .. ..	1,07,091.97					
b) NSS Project Sector .. ..	62,801.32		1,69,893.29			
				1,62,147.92		
2. On account of Plan Revenue Expenditure :						
Excess of expenditure over income in 1966-67			630.16			
3. On account of Capital Expenditure for 1966-67 (net)			19,66,861.88 <sup>(a)</sup>			
Less : Amount of grant received during the year .. ..	17,60,000.00			2,06,861.82	2,69,619.90	

<sup>(a)</sup> Net after adjustment of Rs. 8,828/ (10,890/-2,062/-) in respect of previous year.S. P. Mukherjee  
Senior Accounts OfficerP. Roy  
Joint Secretary

## SCHEDULE IV

AMOUNT CLAIMED FROM GOVERNMENT OF INDIA AND REFLECTED (BUT UNDER CORRESPONDENCE) AS ON 31st MARCH, 1967

Particulars	Rs.	P.	Rs.	P.
1. On account of Non-project Sectors : As per last account :				
.1 Excess of expenditure over income for 1963-64 .. ..		1,43,823.76		
.2 1964-65 .. ..	3,31,061.77		4,74,706.63	
2. On account of NSS Project Sector :				
.1 Amount recoverable against delivery of and results .. ..			2,00,000.00	
				8,74,706.63

S. P. Mukherjee  
Senior Accounts OfficerP. Roy  
Joint Secretary

**INDIAN STATISTICAL INSTITUTE**

**SCHEDULE V**

**EXCESS OF EXPENDITURE OVER RECEIPTS IN RESPECT OF MISCELLANEOUS PROJECTS AND ACTIVITIES ON BEHALF OF THE GOVERNMENT OF INDIA AND OTHER BODIES AS ON 31 MARCH 1967**

Projects and Activities	Upto 31st March 1966		For the year	Upto 31st March 1967	
	Rs.	P.	Rs. P.	Rs.	P.
<b>1. On behalf of Government of India :</b>					
1. Research and Planning Committee of the Planning Commission for Sociological Studies [Note (a)]	23,033.	64	721.	50	23,755.14
3. ISEC Colombo Plan Fellowship :					
As per last account .. .. .	81,803.	26			
Less : amount received during the year .. .. .	52,474.	93	9,328.	33	
Expenditure during the year .. .. .	1,06,671.	98			
Less : amount received during the year .. .. .	7,889.	02	98,982.	96	
Sub-total : (1.3) .. .. .			9,328.	33	98,982.96
3. Director of Health Services for Demographic Studies :					
As per last account .. .. .	1,32,101.	98			
Less : amount received during the year .. .. .	1,00,000.	00	32,101.	98	
Expenditure during the year .. .. .				99,978.	90
Sub-total : (1.3) .. .. .			32,101.	98	99,978.80
Sub-total : (1.1 to 1.3) [Note (a)] .. .. .			64,463.	95	1,99,883.28 [Note (b)]
2. On behalf of other bodies :					
1. International Social Science Council for International Conference on Comparative Research in Social Change and Regional Disparities .. .. .				13,759.	59
Total : (1-2) .. .. .			64,463.	95	2,13,442.85
					2,77,906.80

Notes : (a) Of this amount, claim in respect of Rs. 18,033.64 has been withdrawn by the Institute. The balance amount has already been claimed from Government of India but is pending acceptance.

(b) To be claimed from Government of India.

S. P. Mukherjee  
Senior Accounts Officer

P. Roy  
Joint Secretary



THIRTY-FIFTH ANNUAL REPORT : 1966-67

SCHEDULE VI

DETAILS OF CASH IN HAND AS ON 31st MARCH 1967

At the Central Office and other offices of the Institute.

	Ra.	P.	Ra.	P.
<b>At Calcutta :</b>				
Central Office .. .. .	1,49,044.	49		
City Office .. .. .		424.45		
Field Branch .. .. .	3,731.85		1,53,200.	80
<b>At Delhi .. .. .</b>				12,307.14
<b>At Giridih .. .. .</b>				705.19
<b>At Bangalore :</b>				
SQC .. .. .	977.89			
DRTD .. .. .	40.67		1,018.36	
<b>At Ernakulam .. .. .</b>				7,860.07
<b>At Madras :</b>				
RTS .. .. .	94.73			
SQC .. .. .	2,995.95		3,991.68	
<b>At Bombay :</b>				
SQO .. .. .	6,176.67			
NSS .. .. .	—			6,176.67
<b>At Baroda .. .. .</b>				7,904.41
<b>At Coimbatore .. .. .</b>				3,415.78
<b>At Tokyo, Japan .. .. .</b>				9,162.90
[Note (b) on the Balance Sheet of the Institute]				2,04,640.00
The above amount of Ra. 2,04,640.00 has been shown in the following Balance Sheets of the Institute and its various funds, as below :				
The Institute .. .. .				10,759.25
<b>Other Funds :</b>				
Visiting Professors and Fellows Fund .. .. .	113.13			
Leave Salary Fund .. .. .	4,053.22			
Gratuity Fund .. .. .	34,264.07			
Development Fund I .. .. .	11,521.94			
Development Fund II .. .. .	40,851.76			
Supervision Fee Fund .. .. .	22,596.40			
Director's (Trust) Fund .. .. .	59,425.89			
ISI General Provident Fund .. .. .	21,084.54			
			1,93,910.75	
			2,04,640.00	

S. P. Mukherjee  
Senior Accounts Officer

P. Roy  
Joint Secretary

SCHEDULE VII

DETAILS OF BANK BALANCES (EXCEPT AMERICAN EXPRESS CO. INC., CALCUTTA) AS ON 31st MARCH 1967

	Ra.	P.
State Bank of India, Shambazar—Account 'B' (including Cheques in hand Ra. 1,41,769.50)	7,17,508.31	
State Bank of India, Delhi—Account 'A'	1,673.23	
State Bank of India, Delhi—Account 'B'	689.10	
United Bank of India Ltd., Baranagar	5,786.14	
United Bank of India Ltd., Delhi	73,108.69	
United Bank of India Ltd., Giridih	2,188.11	
United Commercial Bank Ltd., Giridih	623.61	
State Bank of India, Bangalore	31,040.90	
State Bank of Travancore, Ernakulam	4,384.09	
State Bank of India, Madras	3,637.90	
Bank of Baroda, Ltd., Bangalore	7,719.82	
Nash Bank Ltd., Calcutta (in liquidation) doubtful	4,143.27	
	8,52,342.86	

S. P. Mukherjee  
Senior Accounts Officer

P. Roy  
Joint Secretary

INDIAN STATISTICAL INSTITUTE

SCHEDULE VIII

GENERAL FUND AS ON 31st MARCH 1967

Particulars	Rs.		P.	
1. Opening Balance .. .. .				1,16,63,760.49
2. Add : assets added during the year :				
1. Capital Expenditure Grant Account : As per Statement of Account of Grant received and Expenditure for the year. .. .. .			19,58,861.83	
2. Current Expenditure Grant Account : As per Schedule I annexed to the Balance Sheet. ..			2,35,461.88	
3. Rockefeller Foundation Grant Account : As per Schedule I annexed to the Balance Sheet. ..			9,459.21	21,01,782.81
				<u>1,38,55,533.40</u>
3. Less :				
1. Depreciation written off during the year :				
a) On Fixed Assets as per Schedule I .. .. .	6,46,735.86			
b) On O.T.T. telephone as per in Balance Sheet .. .. .	1,084.08		6,47,799.94	
2. Excess of expenditure over income on Capital Expenditure Account for 1965-66 foregone during the year .. .. .			36.90	6,47,638.84
				<u>1,32,07,896.56</u>

S. P. Mukherjee  
Senior Accounts Officer

P. Roy  
Joint Secretary

## THIRTY-FIFTH ANNUAL REPORT : 1966-67

## SCHEDULE IX

## LOANS FROM OTHER FUNDS AS ON 31st MARCH 1967

Funds	Rs.	P.
As per Balance Sheets of :		
1. Gratuity Fund .. ..	24,87,000.00	
2. Development Fund I .. ..	1,08,000.00	
3. Development Fund II .. ..	3,86,000.00	
4. Supervision Fee Fund .. ..	60,000.00	
5. Leave Salary Fund .. ..	75,000.00	
6. Provident Fund .. ..	6,00,000.00	
<b>Total :</b>	<b>37,36,000.00</b>	

S. P. Mukherjee  
Senior Accounts Officer

P. Roy  
Joint Secretary

INDIAN STATISTICAL INSTITUTE

SCHEDULE X

EXCESS OF RECEIPTS OVER EXPENDITURE IN RESPECT OF MISCELLANEOUS  
PROJECTS AND ACTIVITIES ON BEHALF OF GOVERNMENT OF INDIA AND OTHER BODIES AS ON 31st MARCH 1967

Projects and Activities	Net excess of receipts (+) expenditure (-)				Upto	
	Upto 31st March 1966		For the year		31st March 1967	
	Rs.	P.	Rs.	P.	Rs.	P.
1. On behalf of Government of India :						
1. Director of Health Services for Family Planning Survey :						
As per last account .. ..	-40,324.38					
Less : amount received during the year ..	28,000.00		-14,324.38			
Amount received during the year for 1966-67 .. ..	1,24,600.00					
Less : expenditure during the year ..	1,00,698.61			+25,901.49		
Sub-total : (1.1) .. ..			-14,324.38	+25,901.49		11,577.11
2. On behalf of other bodies :						
1. Tata Institute of Social Sciences for Sociology of Education Project ..						
			+7,762.00	-4,426.68		3,335.43
2. Asia Foundation for International Conference on Comparative Research in Social Change and Regional Disparities :						
Amount received during the year ..	23,730.00					
Less : expenditure during the year ..	19,071.20			+4,658.80		4,658.80
Total : (1-2) .. ..			-6,572.38	+26,134.71		19,562.33

S. P. Mukherjee  
Senior Accounts Officer

P. Roy  
Joint Secretary

THIRTY-FIFTH ANNUAL REPORT : 1968-67

SCHEDULE XI

SECTOR-WISE BREAK UP OF INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31st MARCH 1967

Sectors	Grant from Cabinet Secretariat, Government of India		Miscellaneous income		Total income	Total expenditure	Excess of income over expenditure (+) Excess of expenditure over income (-)
	(2)	(3.1)	(3.2)	(4)			
(1)	Ra. P.	Ra. P.	Ra. P.	Ra. P.	Ra. P.	Ra. P.	Ra. P.
<b>Non-Plan</b>							
<b>1. Non-Project Sectors (including UNTAA)</b>							
1. RTS including CAMEL ..	35,78,686.81	65,897.50	195.55	36,44,769.86	38,20,374.71	+ 24,385.25	
2. Planning Division ..	13,39,608.00	—	58.70	13,39,666.70	12,95,310.89	+ 43,855.81	
3. SQC ..	7,85,796.00	5,62,707.15	39.13	13,38,542.28	13,08,193.72	+ 30,348.56	
4. ISEC ..	2,04,583.00	—	19.58	2,04,602.58	1,96,105.21	+ 8,502.35	
Sub-total: ..	59,08,668.81	6,18,604.65	313.04	65,27,576.50	64,20,484.53	+1,07,091.97	
2. Project Sector—NSS ..	91,16,232.00	—	78.26	91,16,310.26	90,53,508.94	+ 62,801.32	
3. UNTAA ..	3,180.00	94,368.12	—	97,548.12	4,29,567.33	-3,32,041.21	
<b>Total Project &amp; Non-Project Sectors: (Items 1 to 3)</b> ..	<b>1,50,28,080.81</b>	<b>7,12,970.77</b>	<b>391.30</b>	<b>1,57,41,412.88</b>	<b>1,59,03,660.80</b>	<b>-1,62,147.92</b>	
<b>4. Miscellaneous:</b>							
1. Family Planning Survey ..	—	1,26,800.00	—	1,26,800.00	1,00,098.51	+ 25,801.49	
2. Demographic Research ..	—	—	—	—	99,678.80	- 99,678.80	
3. Sociology of Education (Tata Institute of Social Sciences) ..	—	—	—	—	4,425.58	- 4,425.58	
4. Research and Planning Committee of the Planning Commission for Sociological Studies ..	—	—	—	—	721.50	- 721.50	
5. Asia Foundation for Sociological Conference ..	—	23,730.00	—	23,730.00	19,071.30	+ 4,658.80	
6. International Social Science Council ..	—	—	—	—	13,769.69	- 13,769.69	
<b>Total: (Items 1 to 4)</b> ..	<b>1,50,28,080.81</b>	<b>8,53,300.77</b>	<b>391.30</b>	<b>1,58,91,742.88</b>	<b>1,61,42,216.08</b>	<b>-2,60,473.10</b>	
<b>Plan</b>							
<b>1. Non-Project Sectors:</b>							
1. RTS including CAMEL ..	2,85,000.00	—	—	2,85,000.00	71,087.02	+1,22,068.38	
2. Planning Division ..					53,494.17		
3. Statistical Quality Control ..					38,350.43		
4. International Statistical Education Centre ..					—		
Sub-total: ..	2,85,000.00	—	—	2,85,000.00	1,42,931.62	+1,22,068.38	
2. Project Sector—NSS ..	2,10,000.00	—	—	2,10,000.00	3,32,698.54	-1,22,698.54	
<b>Total: Project and Non-Project Sectors</b> ..	<b>4,75,000.00</b>	<b>—</b>	<b>—</b>	<b>4,75,000.00</b>	<b>4,76,630.16</b>	<b>- 830.16</b>	

S. P. Mukherjee  
Senior Accounts Officer

P. Roy  
Joint Secretary

INDIAN STATISTICAL INSTITUTE

STATEMENT OF ACCOUNT OF GRANT RECEIVED FROM GOVERNMENT OF INDIA IN RESPECT OF  
CAPITAL PROJECTS AND EXPENDITURE FOR THE YEAR ENDED 31st MARCH 1967.

1966 Ra. P.	Expenditure	Ra. P.	1966 Ra. P.	Grant	Ra. P.
	Additions to Assets during the year : (Note (a) below)			1. Grant received from Government of India for current year's Capital expenditure ..	17,50,000.00
	1. As per schedule I (column 6.0) to the Balance sheet of Indian Statistical Institute (not after adjust- ment of Rs. 8,8387 (Net) in respect of previous year)	19,27,844.82	15,40,000.00		
14,20,148.00				2. Excess of expenditure over Grant received for the year to be claimed from Government of India ..	2,06,861.82
	2. O.Y.T. telephone payments during the year ..	4,167.00	38.90		
	3. Expenditure on Joint Pro- ject for the construction of Electronic Computers (in progress) ..	25,040.00			
1,19,888.90					
<u>15,40,038.90</u>		<u>19,56,861.82</u>	<u>15,40,038.90</u>		<u>19,56,861.82</u>

Note : (a) Excluding cost of Air-Conditioner Rs. 5167.05 charged to "Other Miscellaneous Expenses" (Item 15.1 of the Expenditure side of Income and Expenditure Account).

S. P. Mukherjee  
Senior Accounts Officer

P. Roy  
Joint Secretary

We have examined the above statement with the books and records maintained by the Institute and produced to us and the information and explanations given and have found it to be in accordance therewith.

Calcutta,  
8th October, 1967.

PRINCE WATERHOUSE, FRAT & CO.  
Chartered Accountants

THIRTY-FIFTH ANNUAL REPORT : 1966-67

VISITING PROFESSORS AND FELLOWS FUND

BALANCE SHEET AS AT 31st. MARCH 1967

1966	Fund and Liabilities	1966	Property and Assets	
Ra. P.		Ra. P.		Ra. P.
	Fund :			
113.13	As per last account ..	113.13	Cash in hand	
			As per Schedule VI	
			to the Institute's	
		113.13	Balance Sheet	.. 113.13
<u>113.13</u>		<u>113.13</u>		<u>113.13</u>

Note :—Transactions during the year in respect of Visiting Professors and Fellows have not been incorporated in these Accounts but have been included in the Income and Expenditure Account of the Institute.

This is the Balance Sheet referred to in our report of even date

Calcutta, 8th October 1967. S. P. Mukherjee Senior Accounts Officer P. Roy Joint Secretary PRINCE WATERHOUSE, PRAY & Co. Chartered Accountants

LEAVE SALARY FUND

BALANCE SHEET AS AT 31st MARCH 1967

1966	Fund and Liabilities	1966	Property and Assets	
Ra. P.		Ra. P. Ra. P.	Ra. P.	Ra. P.
	Fund :		Current Assets :	
	As per last account ..	1,43,998.11	Amount due from the	
			Institute on Loan Account	75,000.00
	Add: Contributions received during the year from other bodies or institutions for workers on deputation ..	5,689.04	Cash in hand	
			As per Schedule VI	
			to the Institute's	
		3,998.11	Balance Sheet.	.. 4,063.22
		<u>1,49,687.15</u>		
1,43,998.11	Less : Leave salary paid during the year ..	70,613.83		79,063.22
		<u>79,063.22</u>		
<u>1,43,998.11</u>		<u>79,063.22</u>	<u>1,43,998.11</u>	<u>79,063.22</u>

This is the Balance Sheet referred to in our report of even date

Calcutta, 8th October, 1967. S. P. Mukherjee Senior Accounts Officer P. Roy Joint Secretary PRINCE WATERHOUSE, PRAY & Co. Chartered Accountants

INDIAN STATISTICAL INSTITUTE

GRATUITY FUND

BALANCE SHEET AS AT 31st MARCH 1967

1966		Fund and Liabilities		1966		Property and Assets	
Rs.	P.	Rs.	P.	Rs.	P.	Rs.	P.
Fund :				Current Assets :			
		As per last account ..	24,71,380.23			Amount due from the Institute on Loan Accounts ..	24,07,000.00
		Add : Employer's contribution for the year :				Cash in hand : As per Schedule VI to the Institute's Balance Sheet. ..	34,264.07
		(i) From the Institute	3,06,602.41				
		(ii) From other bodies or Institutions for workers on deputation ..	2,390.00	3,11,992.41			
				27,83,372.64			
24,71,380.23		Less : Paid during the year ..	2,62,108.67	25,31,264.07			
<u>24,71,380.23</u>				<u>25,31,264.07</u>	<u>24,71,380.23</u>		<u>25,31,264.07</u>

This is the Balance Sheet referred to in our report of even date.

Calcutta, 6th October, 1967. S. P. Mukherjee Senior Accounts Officer P. Roy Joint Secretary PRICE WATERHOUSE, FRAY & Co. Chartered Accountants

DEVELOPMENT FUND I

BALANCE SHEET AS AT 31st MARCH 1967

1966		Fund and Liabilities		1966		Property and Assets	
Rs.	P.	Rs.	P.	Rs.	P.	Rs.	P.
Fund :				Current Assets :			
1,19,521.94		As per last account ..	1,19,521.94	1,08,000.00		Amount due from the Institute On Loan Accounts ..	1,08,000.00
				11,521.94		Cash in hand : As per Schedule VI to the Institute's Balance Sheet. ..	11,521.94
<u>1,19,521.94</u>			<u>1,19,521.94</u>	<u>1,19,521.94</u>			<u>1,19,521.94</u>

This is the Balance Sheet referred to in our report of even date.

Calcutta, 6th October 1967. S. P. Mukherjee Senior Accounts Officer P. Roy Joint Secretary PRICE WATERHOUSE, FRAY & Co. Chartered Accountants



## THIRTY-FIFTH ANNUAL REPORT: 1966-67

## DEVELOPMENT FUND II

BALANCE SHEET AS AT 31st MARCH 1967

1966 Fund and Liabilities				1966 Property and Assets			
Rs.	P.	Rs.	P.	Rs.	P.	Rs.	P.
Fund :				1. Fixed Assets :			
As per last account				12,82,306.37	6,51,114.98	As per schedule annexed .. 6,50,088.80	
Less : excess of expenditure over income for the year				12,82,306.37	1,610.46	2. O.Y.T. telephons	
						As per last account .. 8,009.69	
						Less : depreciation @ 5% .. 400.48	
						7,609.21	
						3. Investment in Government— securities—at cost	
						Rs. 50,000/- 3% First Develop- ment Loan 1970-76 (market value Rs. 44,175.00)	
						As per last account .. 45,533.75	
						4. Current Assets :	
						.1 Stock of building materials—at cost	
					2,39,121.46	1,81,711.39	
						.2 Amount due from the Institute on Loan Account	
					3,35,000.00	3,98,000.00	
						.3 Cash in hand ..	
						As per Schedule VI to the Institute's Balance Sheet	
					3,525.50	40,851.76	
<hr/>		<hr/>		<hr/>		<hr/>	
12,82,306.37		12,80,794.91	12,82,306.37			12,80,794.91	

This is the Balance Sheet referred to in our report of own date

Calcutta  
6th October, 1967.

S. P. Mukherjee  
Senior Accounts Officer

P. Roy  
Joint Secretary

PRINCE WATERHOOD, FRASER & CO.  
Chartered Accountants

INDIAN STATISTICAL INSTITUTE  
DEVELOPMENT FUND II

INCOME AND EXPENDITURES ACCOUNT FOR THE YEAR ENDED 31st MARCH 1967

1966	Expenditure			1966	Income		
Rs. P.		Rs. P.	Rs. P.	Rs. P.		Rs. P.	
	To depreciation						
20,519.53	On fixed assets ..	21,026.18	21,748.90	By rent		18,420.20	
	Amount written off						
	O.Y.T. Telephone		400.48		Interest on investments		
588.95	Advances			1,496.00	(Less Bank charge Rs. 4.00)	1,496.00	
	- Excess of income				Excess of expenditure over		
2,429.48	over expenditure				income transferred to Fund		
				-	.. Account	..	1,810.48

23,244.90

21,426.66

23,244.90

21,426.66

Calcutta,  
8th October, 1967.

S. P. Mukherjee  
Senior Accounts Officer

P. Roy  
Joint Secretary

PRICE WATERHOUSE, FRAT & Co.  
Chartered Accountants

## THIRTY-FIFTH ANNUAL REPORT : 1966-67

## DEVELOPMENT FUND II

SCHEDULE OF FIXED ASSETS AS ON 31st MARCH 1967

Particulars	Written down value as on 31st March 1966	Depreciation for the year		Written down value as on 31st March 1967
		rate	amount	
(1)	(2)	(3.0)	(3.1)	(4)
<b>1. LAND :</b>				
.1 Bidyastan Sarani, Baranagar .. ..	50,000.00			50,000.00
.2 169 Gopal Lal Tagore Road, Baranagar .. ..	1,03,855.00			1,03,855.00
.3 Rose Villa, Giridih .. ..	1,07,502.72			1,07,502.72
.4 Biraja Kutir, Giridih .. ..	7,445.19			7,445.19
.5 Takdah Planters' Club, Darjeeling .. ..	25,996.50			25,996.50
sub-total : (1) .. ..	2,94,799.41			2,94,799.41
<b>2. BUILDINGS :</b>				
.1 169 Gopal Lal Tagore Road, Baranagar .. ..	24,098.35	2.5%	602.46	23,495.89
.2 Rose Villa, Giridih .. ..	1,01,327.07	"	2,533.43	98,803.64
.3 Health Home, Giridih* .. ..	13,416.68	"	335.41	13,081.27
sub-total : (2) .. ..	1,38,852.10		3,471.30	1,35,380.80
<b>3. SHEDS AND STRUCTURES :</b>				
.1 Students' hostel etc. at 206 Barrackpore Trunk Road, Baranagar .. ..	1,33,161.02	7.5%	9,987.08	1,23,173.94
.2 169 Gopal Lal Tagore Road, Baranagar .. ..	60,212.80	"	4,515.96	55,696.84
.3 Post Office at 204 Barrackpore Trunk Road	633.16	"	47.49	585.67
.4 Bidyastan Sarani, Baranagar .. ..	1,646.21	"	123.46	1,522.75
.5 Petty construction at Giridih .. ..	7,630.46	"	572.28	7,058.18
sub-total : (3) .. ..	2,03,283.65		15,246.27	1,88,037.38
<b>4. INTERNAL TELEPHONE SYSTEM</b> .. ..				
	5,273.59	10%	527.36	4,746.23
<b>5. MOTOR CARS</b> .. ..				
	8,908.23	20%	1,781.25	7,126.98
<b>Total : (1-5)</b> .. ..	<b>6,51,114.98</b>		<b>21,028.18</b>	<b>6,30,086.80</b>

\* Situated on land, acquired as gift, the value of which has been ignored for the purposes of these accounts.

S. P. Mukherjee  
Senior Accounts OfficerP. Roy  
Joint Secretary

INDIAN STATISTICAL INSTITUTE

SUPERVISION FEE FUND

BALANCE SHEET AS AT 31st MARCH 1967

1966		Fund and Liabilities		1966		Property and Assets	
Rs.	P.	Rs.	P.	Rs.	P.	Rs.	P.
Fund :				Fixed Assets :			
2,16,304.87		As per last account	2,16,304.87	Land :			
				At Calcutta—303, Barraokpore Trunk Road <sup>(a)</sup> .. 97,556.95			
				1,12,218.11		At Giridih—Farmland <sup>(b)</sup> .. 14,961.18	1,12,218.11
				Current Assets :			
				Amount due on Loan Account :			
				(a)	From the Institute ..	60,000.00	
				(b)	From IBI Small Scale In- dustries Experimental Unit	11,490.38	
				678.65	(c) From ISIJU Computer Project ..	10,000.00	81,490.38
				Cash in hand ..			
				19,387.21	As per Schedule VI to the In- stitute's Balance Sheet		22,596.40

2,16,304.87

2,16,304.87

2,16,304.87

2,16,304.87

NOTES :

<sup>(a)</sup> Value of the building on this land is shown in the Fixed Assets Schedule attached to the Institute's Balance Sheet (Note (b) in the Schedule I).

<sup>(b)</sup> Excluding Rs. 9,614.51 paid out of General Fund and included in the accounts of the Institute. (Item 2.1 of the Schedule I).

This is the Balance Sheet referred to in our report of even date.

Calcutta,  
8th October, 1967.

S. P. Mukherjee  
Senior Accounts Officer

P. Roy  
Joint Secretary

PRINCE WATERHOUS, PRAY & Co.  
Chartered Accountants

THIRTY-FIFTH ANNUAL REPORT : 1966-67  
ELECTRONIC DATA PROCESSING AND COMPUTATION UNIT  
BALANCE SHEET AS AT 31st MARCH 1967

1966 Fund and Liabilities				1966 Property and Assets			
Rs.	P.	Rs.	P.	Rs.	P.	Rs.	P.
<b>1. Fund :</b>				<b>1. Fixed Assets :</b>			
				<b>1. Magnetic tape :</b>			
				Written down value			
		48,006.57		As per last account			
				66,374.00			
				<b>Less :</b> depreciation			
				written off during			
				the year			
48,006.57		6,70,736.56	7,18,743.13	66,374.00		16,078.00	40,198.00
<b>2. Liabilities :</b>				<b>2. Furniture and fittings :</b>			
8,26,835.52				Written down value			
				As per last account			
				1,532.10			
				<b>Add :</b> additions dur-			
				ing the year			
				251.22			
				1,783.32			
				<b>Less :</b> depreciation			
				written off during			
				the year			
				1,632.10			
				..			
				153.21			
				1,630.11			
				<b>3. Electrical equipment :</b>			
				Written down value			
				As per last account			
				1,700.00			
				<b>Less :</b> depreciation			
				written off during			
				the year			
				170.00			
				..			
				1,530.00			
				43,258.11			
				<b>2. Current Assets :</b>			
				1,97,869.04			
				<b>1. Sundry debtors ..</b>			
				86,479.20			
				<b>2. Amount due from</b>			
				the Institute on			
				Loan Account ..			
				8,62,192.33			
				9,38,671.53			
				<b>3. Machine Tabulation</b>			
				<b>Expenses (Importa-</b>			
				<b>tion charges) to the</b>			
				<b>extent not written</b>			
				<b>off :</b>			
				As per last account			
				2,60,900.00			
				<b>Less :</b> Written off dur-			
				ing the year			
				..			
				1,30,900.00			
				1,30,900.00			
<u>8,74,943.19</u>		<u>11,12,929.64</u>		<u>8,74,943.19</u>		<u>11,12,929.64</u>	

S. P. Mukherjee  
Senior Accounts Officer

P. Roy  
Joint Secretary

We have examined the Balance Sheet of the Indian Statistical Institute Electronic Data Processing and Computation Unit as at 31st March 1967 and the annexed Income and Expenditure Account for the year ended that date with the books and records maintained by the Institute and produced to us and the information and explanations given and have found them to be in accordance therewith.

Calcutta,  
8th October, 1967.

PRICE WATERHOUSE, FRAY & CO.  
Chartered Accountants

INDIAN STATISTICAL INSTITUTE  
ELECTRONIC DATA PROCESSING AND COMPUTATION UNIT  
INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31st MARCH 1967

1966		Expenditure		1966		Income		
Rs.	P.	Rs.	P.	Rs.	P.	Rs.	P.	
10,142.	07	1. To Salary and other remuneration ..	93,858.	12		1. By Service charges (including Rs. 6,20,530.00 billed to the Institute)	12,57,022.	74
		2. Machine Tabulation expenses :				2. Amount billed to Government of India for tabulation work ..	4,55,000.	00
5,88,225.	35	.. Hire and maintenance ..	7,80,275.	71	8,70,873.	39		
30,023.	30	3. Cards, rent, electricity, stores, stationery and other charges ..	65,238.	14				
		3. Depreciation on Fixed Assets :						
		Magnetic tape	18,076.	00				
		Furniture and fittings	153.	21				
18,078.	00	Electrical equipment	170.	00	18,299.	21		
1,30,000.	00	4. Importation charges written off	1,30,000.	00				
96,408.	57	5. Excess of income over expenditure transferred to Fund Account ..	6,70,738.	56				
8,70,873.39		17,66,487.74		8,70,873.39		17,56,487.74		

Calcutta,  
6th October, 1967.

S. P. Mukherjee  
Senior Accounts Officer

P. Roy  
Joint Secretary

PRICE WATERHOUSE, FRAT & Co.  
Chartered Accountants

## INDIAN STATISTICAL INSTITUTE GENERAL PROVIDENT FUND

### AUDITORS' REPORT

We have examined the Balance Sheet as at 31st March 1967 of the Indian Statistical Institute General Provident Fund, signed by us under reference to this report, and the relative Income and Expenditure Account for the year ended that date with the books and records of the Fund maintained by the Institute and produced to us and, subject to the below mentioned remarks, have found them to be in accordance therewith. The remarks referred to above are :

1. The Board of Trustees as envisaged in Rule 14 read with the Rule 2(f) of the Rules of the Fund has not yet been formed. Accordingly, the investments of the Fund are held by the Institute and the Bank Account of the Fund is maintained in its name.

2. No income-tax has been deducted from the amounts paid in settlement of the members account pending recognition of the Fund by the Commissioner of Income-Tax under the Income-Tax, Act, 1961. The Institute has, however, undertaken to meet any liability which may arise in the event of such non-recognition of the Fund.

3. There have been certain advances to the Institute by the Fund which are not covered by the provisions of the Rules of the Fund. The balance of such advances as at 31st March 1967 was Rs. 6 lakhs.

4. Of the investments, securities to the book value of Rs. 18,99,784.29 were pledged with the State Bank of India for securing an overdraft granted to the Institute by them. The overdraft was however liquidated in May 1966. As was allowed in the previous year, no overriding interest for utilising such securities by the Institute during the year was allowed this year.

5. Membership subscriptions were neither deposited to the Fund's Bank Account nor invested in the manner required by the Rule 12 of the Fund within the year.

6. Rs. 3,25,470.18, being undistributed income including amount forfeited as at 31st March 1967, includes Employer's contributions together with interest thereon forfeited under Rule 25 and available for disposal of the Trustees as provided for in Rule 27, the extent of which is not readily ascertainable.

7. Under the provisions of Rule 11 of the Fund, interest/income should be included in the accounts as and when received. For the purposes of the above accounts, however, interest accrued on Rs. 50,000/- 12 Year National Plan Savings Certificates has been calculated at certain fixed rate so that it is accrued evenly over twelve years during which the National Plan Savings Certificates mature. Certain other accrued interest has also been included in these accounts.

Calcutta,  
6th October, 1967.

PRICE, WATERHOUSE, FRAT & Co.  
Chartered Accountants

INDIAN STATISTICAL INSTITUTE

INDIAN STATISTICAL INSTITUTE

BALANCE SHEET

1966		Fund and Liabilities		Rs.	P.	Rs.	P.	Rs.	P.
Rs.	P.								
		Members' own subscription :							
		As per last account .. .. .				34,73,001.31			
		Add : during the year .. .. .				4,19,987.36			
34,73,001.31		Less : refunded during the year .. .. .				39,92,988.87			
						3,17,725.91		36,76,262.76	
		Employer's contribution :							
		As per last account .. .. .				34,73,001.31			
		Add : during the year .. .. .							
		i) from the Institute (including Rs. 638.84			5,16,840.61				
		in respect of employees of EDPCU) .. .. .							
		ii) from other bodies or institutions for			4,348.85		5,19,987.36		
		workers on deputation .. .. .							
		Less : i) refunded during the year .. .. .				3,06,162.49			
34,73,001.31		ii) amount forfeited .. .. .			11,663.42		3,17,725.91		36,76,262.76
		Members' voluntary subscription :							
		As per last account .. .. .				1,63,626.70			
		Add : during the year .. .. .				26,987.29			
1,63,626.70		Less : refunded during the year .. .. .				1,90,313.99			
						64,027.65		1,36,286.34	
		Interest payable :							
		a) On members' own subscription :							
		As per last account .. .. .				7,59,063.83			
		Add : during the year .. .. .				2,03,814.17			
7,59,063.83		Less : paid during the year .. .. .				9,62,878.00			
						71,015.00		8,81,863.00	
		b) On employer's contribution :							
		As per last account .. .. .				6,78,833.63			
		Add : during the year .. .. .				1,97,421.34			
		Less : i) paid during the year .. .. .			63,023.18				
6,78,833.63		ii) amount forfeited .. .. .			788.68		63,791.76		8,09,463.11
		c) On members' voluntary subscription :							
		As per last account .. .. .				31,617.63			
		Add : during the year .. .. .				7,275.04			
81,617.63		Less : paid during the year .. .. .				38,702.67			
						10,138.61		29,663.96	
		Undistributed income including amounts forfeited :							
		As per last account .. .. .				2,80,235.77			
		Add : i) excess of income over expenditure for the			32,962.41				
		year .. .. .			12,322.00				
2,80,235.77		ii) amount forfeited during the year .. .. .				46,934.41		3,25,470.18	
88,59,279.99								96,36,262.11	

Calcutta,  
8th October, 1967.

S. P. Mukherjee  
Senior Accounts Officer

P. Roy  
Joint Secretary



THIRTY-FIFTH ANNUAL REPORT : 1966-67

GENERAL PROVIDENT FUND

as at 31st March 1967

1966		Property and Assets			
Ra.	P.		Ra. P.	Ra. P.	Ra. P.
Investments at cost :					
a) Government Promissory Notes :					
		Ra. 18,65,000/- 3% conversion loan 1949/56 ..	13,00,769.60		
		Ra. 13,05,000/- 3% 1st Development Loan ..	11,45,154.69		
		1970/76 .. ..			
		Ra. 13,00,000/- 4½% loan 1985 .. ..	13,00,000.00	37,45,924.29	
		Ra. 44,70,000/- (Market value Ra. 33,65,365.00)			
		b) Ra. 50,000/- 12 year National Plan Savings Certificate .. ..		50,000.00	
48,45,924.29		c) Fixed Deposit with State Bank of India, Shambar .. ..		20,00,000.00	67,95,924.29
		Loans to members (including non-repayable loans under Rule 21(e)) .. ..			10,52,944.00
10,91,332.90		Current Assets :			
		Interest accrued :			
58,432.76		a) On Government Promissory Notes (excluding interest accrued but not due) .. ..	95,438.50		
43,641.72		b) On 12 year National Plan Savings Certificate .. ..	20,566.22		
17,600.00		c) On Fixed Deposit with State Bank of India, Shambar .. ..	92,500.00	2,08,506.72	
8,774.70		Income-tax recoverable .. ..		8,774.70	
		Amount due from the Institute :			
5,15,768.21		On account of employer's contribution .. ..			
5,00,000.00		On loan account .. ..	8,00,000.00	6,00,000.00	
		Cash balances :			
871.44		In hand .. ..		21,084.54	
17,58,027.98		At Bank .. ..		18,18,027.88*	25,66,393.82

86,56,379.98

95,35,993.11

\* An amount of Ra. 18,00,000/- has since been invested in fixed deposit with State Bank of India, Shambar on 16th July 1967.

This is the Balance Sheet referred to in our report of above date.

PAUL WATERHOUSE, PEAT & Co.  
Chartered Accountants

INDIAN STATISTICAL INSTITUTE

INDIAN STATISTICAL INSTITUTE

INCOME AND EXPENDITURE ACCOUNT

1966	Expenditure			Rs. P.	Rs. P.
Rs. P.					
	To interest :				
1,83,666.98	i)	On members' own subscription .. .. .		2,03,814.17	
1,68,289.95	ii)	On Employer's contribution .. .. .		1,87,421.34	
9,168.45	iii)	On members' voluntary subscription .. .. .		<u>7,275.04</u>	3,98,510.55
44,010.80	Excess of income over expenditure .. .. .				32,902.41

4,06,136.18

4,31,412.96

Calcutta,  
8th October, 1967.

S. P. Mukherjee  
Senior Accounts Officer

P. Roy  
Joint Secretary

THIRTY-FIFTH ANNUAL REPORT : 1966-67

GENERAL PROVIDENT FUND

FOR THE YEAR ENDED 31st MARCH 1967

1966		Income		
Rs.	P.		Rs.	P.
By Interest :				
1,53,283.00		i) On G.P. Notes (excluding bank charges Rs. 317.50) ..	1,53,282.25	
4,791.73		ii) On 12 year National Plan Savings Certificate ..	2,928.49	
58,349.31		iii) On Fixed Deposit with the bank .. ..	1,03,355.45	
25,111.19		iv) On Employer's contribution for the previous year @ 5% per annum ..	25,788.40	
31,441.50		v) Overriding interest for utilizing G.P. Notes by the Institute .. .. .	—	
52,500.00		vi) On loan given to the Institute .. .. .	52,500.00	
59,659.45		vii) On loan given to the members .. .. .	53,590.37	4,31,412.96
			<hr/>	
				<hr/>
			4,06,136.16	4,51,412.96

PRICE WATERHOUSE, FRASER & CO.  
Chartered Accountants

#### GOVERNING BODY OF THE RESEARCH AND TRAINING SCHOOL: 1966-67

1. Shri K. P. S. Menon, Chairman (*ex-officio*), 2. Professor P. C. Mahalanobis, Honorary Secretary (*ex-officio*), 3. Dr. C. R. Rao, Director, RTS (*ex-officio*), 4. Shri Dinech Bahl, Managing Director, Capital (Private) Ltd., (*Associated Chambers of Commerce of India*), 5. Dr. S. N. Sen, M.A., Ph.D., Head of the Department of Economics, Calcutta University, (*Indian Economics Association*), 6. Shri B. K. Dutta, Managing Director, United Bank of India Ltd., (*Federation of Indian Chambers of Commerce and Industry*), 7. Joint Director (Dr. K. S. Rao), Central Statistical Organisation, (*Government of India*), 8. Joint Secretary (Shri F. H. Vallibhoj), Ministry of Finance (Financial Adviser to the Cabinet Secretariat), Department of Expenditure, (*Government of India*), 9. Professor S. S. Shrikhande, F.N.I. Professor of Mathematics, Bombay University, (*National Institute of Sciences of India*), 10. Dr. N. S. R. Sastry, M.A., M.Sc., Ph.D., Director of Statistics, Department of Research and Statistics, Reserve Bank of India, (*Reserve Bank of India*), 11. Shri D. C. Pavate, M.A. (Cantab.), Vice-Chancellor, Karnatak University, (*Inter-University Board*), and 12. Professor S. N. Bose, F.R.S., 13. Dr. B. R. Seehachar, D.Sc., F.N.I., Dean, Faculty of Science, University of Delhi, 14. Shri Jagjit Singh, M.A., F.R.S.S., Director, Railway Board, 15. Dr. B. P. Adhikari, M.Sc. (Cal.) Dr. ex., Sc. (Paris), 16. Shri Partha Roy, W.B.C.S., 17. Shri S. Basu, M.Sc., F.N.I., 18. Shri Pitambar Pant, M.Sc., (*Council of the Indian Statistical Institute*).

#### FINANCE COMMITTEE OF THE COUNCIL

1. Chairman of the Institute (*ex-officio*) or his nominee, 2. Secretary of the Institute (*ex-officio*) or his nominee, 3. Director of the Research and Training School (*ex-officio*) or his nominee, 4. Dr. D. K. Bose, 5. Shri K. T. Chanday, 6. Dr. N. Das, 7. Shri S. Dutt, 8. Shri Pitambar Pant, 9. Shri Partha Roy (*Member-Secretary*) or in his absence a person nominated by the Secretary or the Chairman (or the Vice-Chairman authorised by the Chairman to make such nomination), 10. & 11. two representatives nominated by the Government of India, (Joint Secretary, Ministry of Finance, Shri F. H. Vallibhoj and Cabinet Secretary, Shri D. S. Joshi or his representative).

#### FINANCE COMMITTEE OF THE GOVERNING BODY

1. Chairman of the Institute (*ex-officio*) or a Vice-Chairman, authorised by him, 2. Secretary of the Institute (*ex-officio*) or in his absence, a Joint Secretary, 3. Director, RTS or a Joint-Director, if any, in charge of the RTS, 4. & 5. Two representatives of the Government of India (Dr. K. S. Rao and Shri F. H. Vallibhoj), 6. Representative of the Reserve Bank of India on the Governing Body (at present Dr. N.S.R. Sastry), 7. & 8. Two representatives to be elected by the Governing Body from amongst themselves, (Dr. B. R. Seehachar and Dr. B. P. Adhikari.)

#### JOURNAL COMMITTEE OF THE INSTITUTE

1. Professor S. N. Bose, F.R.S., National Professor, Chairman, 2. Shri D. B. Lahiri, 3. Dr. Sujit Kumar Mitra, 4. Dr. Jogabrata Roy, 5. & 6. Editors of *Sankhyā*, (*ex-officio*), 7. One representative of the Governing Body of the Research and Training School (Dr. V. S. Huzurbazar), 8. One member to be nominated by the Secretary of the Institute in consultation with the Director of the RTS., 9. Dr. J. Sethuraman, *Editorial Secretary*, 10. Shri A Mahalanobis, *Secretary*.

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