INDIAN STATISTICAL INSTITUTE

QUESTION PAPERS

for

COMPUTER'S CERTIFICATE EXAMINATIONS

May & November 1966

Price Rupees Two only

INDIAN STATISTICAL INSTITUTE

Computer's Certificate Examination - May 1966

Paper I (Practical) : Elementary Computation

Time : 5 hours Full marks : 100

(a) Figures in the margin indicate full marks.

(b) Use of calculating machines is not permitted.

GROUP A

(Answer any four questions from this group)

1. (a) Is 0 (zero) a significant digit in the following numbers?
(i) 12.70 (ii) .096 (iii) 2750

(b) If the number 864.32 is correct to five significant figures, show that the relative error involved is less than $\frac{1}{8 \times 10^{5-1}}$.

(c) Values of cos x are calculated from a five-figure table of sin x, by use of the relation, $\cos x = (1 - \sin^2 x)^{\frac{1}{2}}$.
State the number of digits to which the calculated values of cos x, may be considered to be correct. (3+4+5)=12

2. Sin θ can be approximately expressed as equivalent to

$$\left[\left(\frac{1}{120}\theta^2 - \frac{1}{6}\right)\theta^2 + 1\right]\theta ;$$

(i) Calculate correct to 4 places of decimals the value of the right hand side when $\theta = \frac{\pi}{6}$.

(ii) Calculate also the percentage error. (8+4)=12

3. (a) Using relevant formulae, evaluate the following

(i) $1.34^3 + 8.66^3 + 30 \times 1.34 \times 8.66$ (ii) $(1.2)^2 + 6 \times (1.2) + 5$

[N.B. : No marks will be given for working by routine processes.]

(b) Evaluate by contracted method, the product of 117.08234 X 2.721426 correct to 3 places of decimals. (3+3+6)=12

Obtain correct to five significant figures the values of the following :

(i) ${}^nC_x \cdot p^x \cdot (1-p)^{n-x}$ for n=10, x=3 and p = 0.2

(ii) $e^{-m} \cdot \frac{m^x}{x!}$ for m=1.5 and x = 4. (6+6)=12

Evaluate the following :

(i) $1^2 + 3^2 + 5^2 + \ldots + 19^2$

(ii) $2^3 + 4^3 + 6^3 + \ldots + 20^3$ (6+6)=12

Neatness (2)

Please turn over

GROUP B

(Answer question 6 and any three questions from this group)

6. The following table gives the cumulative percentage distributions of the number of households (x) and the area owned (y) by those households according to classes of holding sizes'

classes of holding sizes' (in acres)	cumulative percentage	
	number of households	area owned by households
(1)	(2)	(3)
0.00	23.09	-
0.01 - 1.00	47.26	1.37
1.01 - 2.50	61.24	6.23
2.51 - 5.00	74.73	16.32
5.01 - 7.50	82.55	26.28
7.51 - 10.00	87.23	34.72
10.01 - 15.00	92.28	47.50
15.01 - 20.00	94.94	57.08
20.01 - 25.00	96.40	63.83
25.01 - 30.00	97.40	69.55
30.01 - 50.00	99.06	82.46
above 50.00	100.00	100.00

(i) Plot y against x on a graph paper.

(ii) Draw a free hand curve through the plotted points.

(iii) Draw the line y = x on the same diagram.

(iv) Estimate the area covered between the line y=x, and the curve.

(6+4+2+8)=20

7. The following table gives the values of a certain function f(x) for some equidistant values of x.

x	f(x)
0.52	0.5378087
0.53	0.5464641
0.54	0.5549302
0.55	0.5633232
0.56	0.5716157

Find the value of this f(x) when (i) x = 0.5375 and (ii) x = 0.5535.

(5+5)=10

8. Solve graphically

(i) $x^2 - x - 12 = 0$ (ii) $x + 5y = 11$, $5x - 2y = 1$

(6+4)=10

9. Draw the graph of $y = x^3 - 2x^2 - x + 2$. Obtain from the same graph the value of y when x = 0.5 . (8+2)=10

10. The following table gives the annual production of sugar in a factory during the period 1958-1965

year	1958	1959	1960	1961	1962	1963	1964	1965
production (000 mds.)	574	803	1584	1869	1154	1876	2205	1669

(i) Plot the production figures in a graph paper.

(ii) Draw a free hand curve through the plotted points.

(iii) Find from the graph the expected production of sugar for the year 1966.

(4+3+3)=10

INDIAN STATISTICAL INSTITUTE

Computer's Certificate Examination - May 1966

Paper II (Practical) : Compilation and Presentation of Statistics

Time : 5 hours Full marks : 100

(a) Figures in the margin indicate full marks.

(b) Use of calculating machines is not permitted.

GROUP A

(Answer all questions from this group)

A survey was conducted in 1950 to study the incidence of unemployment among urban population, in the employable age group 16 to 60 years. The results of the survey were compiled separately for males and females and for manual and non-manual workers. The incidence of unemployment, measured as percentage of unemployed to total in the labour force, was calculated separately for eight different age groups - 16-20 years, 21-25 years, 26-30 years, 31-40 years, 41-50 years, 51-55 years, 56-58 years and 59-60 years.

It was found that under the non-manual category, the percentage of males unemployed to total males in the labour force in the above age groups were, 58.30, 35.22, 12.15, 5.72, 5.17, 6.51, 8.07 and 6.63 respectively. The corresponding percentages under the manual category were however, 28.82, 14.07, 4.83, 2.70, 3.43, 6.32, 6.52 and 3.90. Among the females the incidence rates in the aforesaid eight age groups were 54.65, 36.44, 14.16, 14.13, 9.07, 13.88, 9.36 and 8.36 respectively in the case of manual category, whereas in the case of non-manual category, these were 82.71, 67.26, 33.57, 20.98, 5.61 and 4.33 respectively in the first six age groups. None of the females above 55 years was found to be un-employed. Further, when the people of both sexes were taken together, it was observed that in the non-manual category, the incidence rates of un-employment were 62.45, 37.71, 13.82, 6.89, 5.22, 6.39, 7.93 and 6.15 respectively as compared to 30.07, 14.92, 5.34, 3.38, 3.91, 6.99, 6.69 and 4.30 respectively in the manual category.

(a) Present the data given above in a suitable statistical table with appropriate headings and notes wherever necessary.

(b) Indicate what tabular lay-out you would use if the purpose is to compare the incidence of unemployment among people of different sexes belonging to the same category. (10+5)=15

The information collected in the schedule used during an agro-economic survey in rural areas included, among others, the area of agricultural land owned, area possessed and area cultivated by each sample household. It was also recorded in the schedule whether the household was a cultivating one. The areas of the holdings owned and possessed ranged between 0.01 to 25.00 acres.

Prepare the lay-outs of two blank tables with suitable headings, to show the interrelation between (i) area owned and area possessed and (ii) area cultivated and area possessed.

[Class intervals should be indicated wherever necessary; assume the total number of classes to be ten in every case.] (5+5)=10

Please turn over

3. State the name of the Official publications (along with their issuing authorities and their periodicity) which should be consulted for any four of the following :

(a) amount of Savings Bank deposits received by Post Offices in India during any month.

(b) the latest available figure of density of population in different districts of Indian States.

(c) the final estimates of area and production of rice for different Indian States.

(d) number of scheduled Banks in each state of India for any year.

(e) authorised capital of Joint Stock Companies registered during any month in different Indian States. (10)

4. From the publications on Official Statistics supplied to you, collect the information in respect of any five of the following :

(a) production of Pig iron in Bihar and West Bengal for two recent consecutive years.

(b) number of factories in Maharashtra and Madras for any two consecutive years.

(c) retail prices of milk in Calcutta and Bombay during any month of two consecutive years.

(d) production of jute in India and tea in Ceylon, during two consecutive years.

(e) quantity of green tea exported from India to Canada, U.S.A., U.K. and Australia during any month of a recent year.

(f) area and production of wheat in India during any two consecutive years.

Display the data neatly, indicating the units and sources; add any foot-notes where necessary. Particulars of the publications used and page references must be given. (15)

GROUP B

(Answer all questions from this group)

5. Draw a cumulative frequency curve (Ogive) for the following data on the age distribution of students.

Age distribution of students

class intervals of age (in years)	number of students
(1)	(2)
less than 12	35
12 - 13	52
13 - 14	85
14 - 15	126
15 - 16	107
16 - 17	40
17 - 18	32
18 - 19	28
19 - 20	21
20 - 25	15
total	541

(12)

Please turn over

6. (a) Using the data below, prepare 2 one-way frequency distributions with 8 class intervals in each case for the jobs by (i) sorter card passages and (ii) tabulator card passages.

job serial number (1)	cards passed through sorting machine (2)	cards passed through tabulating machine (3)	job serial number (1)	cards passed through sorting machine (2)	cards passed through tabulating machine (3)
1	9316	717	41	882	7
2	600	140	42	5861	872
3	960	257	43	4128	46
4	5911	161	44	27178	6371
5	4026	103	45	1390	92
6	705	16	46	14522	271
7	718	114	47	6449	82
8	18198	1394	48	6610	477
9	430	124	49	1728	148
10	1212	732	50	4368	1047
11	10009	2279	51	15069	5271
12	676	49	52	1975	1231
13	622	61	53	5545	657
14	2569	1136	54	3486	431
15	3497	525	55	48	11
16	1644	67	56	1085	70
17	7035	879	57	17254	1154
18	2470	845	58	7642	130
19	5041	2625	59	1858	66
20	7460	485	60	718	114
21	3724	345	61	389	54
22	3820	168	62	822	61
23	5020	665	63	2277	178
24	60	16	64	3534	239
25	8143	407	65	35972	4382
26	1083	250	66	2990	187
27	1185	310	67	12235	1851
28	35972	4382	68	7175	271
29	1572	203	69	48	11
30	15082	1638	70	1085	79
31	2990	187	71	600	140
32	2175	195	72	960	257
33	353	35	73	7460	485
34	159	28	74	800	150
35	1433	168	75	2175	195
36	1314	208	76	12225	3911
37	770	12	77	25835	6315
38	3572	739	78	1420	200
39	14522	1040	79	5094	176
40	25476	12296	80	402	19

(b) Prepare a two-way frequency table of jobs by sorter card passages and tabulator card passages, with the class intervals used in (a).

(5+5+14)=24

Please turn over

7. EITHER

The table below shows the percentage value of imports into India from foreign countries during the years 1950-51 and 1951-52. Represent the data by a suitable diagram.

sri. no.	country of origin	percentage of imports 1950-51	1951-52
(1)	(2)	(3)	(4)
1.	Australia	6.5	1.8
2.	United Kingdom	24.5	20.8
3.	Canada	3.5	2.0
4.	Egypt	6.5	4.2
5.	Iran	7.0	3.0
6.	United States	21.2	0.3
7.	U.S.S.R.	0.5	0.2
8.	Others	30.3	67.7
	total	100.0	100.0

(12)

OR

Draw a suitable statistical diagram or chart to represent the 1951 Census data furnished below :

age groups	number of persons (000) male	female	total
(1)	(2)	(3)	(4)
0 - 4	23,041	23,707	47,648
5 - 9	23,163	22,350	45,513
10 - 14	20,899	19,561	40,460
15 - 19	18,453	17,423	35,876
20 - 24	16,269	15,767	32,036
25 - 34	28,170	26,583	54,762
35 - 44	21,921	19,513	41,434
45 - 64	24,169	22,115	46,284
65 and above	6,293	6,494	12,787

(12)

Neatness (2)

Computer's Certificate Examination - May 1965

Paper III (Practical) : Selected Techniques of Computation

Time : 3 hours | Full marks : 100

(a) Figures in the margin indicate full marks.

(b) Use of calculating machines is permitted.

GROUP A

(Answer question 1 and any other three questions from this group)

1. Complete the following table :

x	f	xf	x^2f	x^3f	x^4f	$(x+1)^4f$
(1)	(2)	(3)	(4)	(5)	(6)	(7)
-7	5					
-6	37					
-5	88					
-4	131					
-3	142					
-2	138					
-1	126					
0	171					
1	99					
2	75					
3	35					
4	27					
5	18					
6	12					
7	5					
8	4					
9	2					
Total						

(i) If T_2, T_3, T_4, T_5, T_6, T_7 are the totals of columns 2, 3, 4, 5, 6, 7 respectively, verify

$$T_7 = T_6 + 4T_5 + 6T_4 + 4T_3 + T_2 .$$

(ii) Calculate $\frac{T_4}{T_2} - \left(\frac{T_3}{T_2}\right)^2$.

(6+4+4)=14

2. Given the following values :

log 315 = 2.49136 log 340 = 2.53148
log 320 = 2.50515 log 350 = 2.54407
log 330 = 2.51851

From the above, find log 3475 using an interpolation formula. Also get the value of log 3475 from tables and estimate the error in the interpolated value.

(10+2)=12

Please turn over

5. Given :

x	y
93.0	11.38
96.2	12.80
100.0	14.70
103.2	17.07

Find the value of x when y = 13.5. (12)

(i) Compute the value of $\frac{\pi}{6}$ from the following relation, using Simpson's one-third rule, with five ordinates.

$$\frac{\pi}{6} = \int_0^{\frac{1}{2}} \frac{dx}{\sqrt{1 - x^2}}$$

(ii) Get the value of π also from tables and determine the error in the calculated value. (10+2)=12

6. One of the values of the function f(x) given below is known to have been wrongly copied. Locate the wrong value, by constructing the table of differences.

x	f(x)
25	0.4226183
30	0.5000000
35	0.5735764
40	0.6427876
45	0.7071068
50	0.7660444
55	0.8191520

GROUP B

(Answer question 8 and any two questions from this group)

7. The following equation has a root lying between 3 and 4.

$$x^4 - 26x^2 + 49x - 25 = 0$$

Find the root correct to three decimal places. (20)

7. Solve –

$$27x + 6y - z = 85$$
$$6x + 15y + 2z = 72$$
$$x + y + 54z = 110$$ (20)

8. Evaluate the determinant

$$\begin{vmatrix} 0.5836 & -2.3088 & 1.614 \\ -0.8294 & 0.6427 & 0.7907 \\ 0.8632 & 2.2308 & -2.3714 \end{vmatrix}$$ (15)

9. Find by use of the graphical method, a solution of

$$\sin x = y + 1.32$$
$$\cos y = x - 0.85$$ (20)

INDIAN STATISTICAL INSTITUTE

Computer's Certificate Examination - May 1966

Paper IV (Practical) : Descriptive Statistics

Time : 3 hours Full marks : 100

(a) Those who have already passed according to old rules in Part IB Section I only, will not be required to answer Group A; but will answer the questions in Group B only, in the time not exceeding 3 hours.

(b) Figures in the margin indicate full marks.

(c) Use of calculating machines is permitted.

GROUP A

(Answer all questions from this group)

1. The following table gives the distribution of efficiency for 300 employees of a manufacturing concern.

efficiency (ratio of individual production to standard production) (1)	number of employees (2)	efficiency (ratio of individual production to standard production) (1)	number of employees (2)
.50 - .59	16	1.10 - 1.19	19
.60 - .69	42	1.20 - 1.29	10
.70 - .79	48	1.30 - 1.39	8
.80 - .89	51	1.40 - 1.49	6
.90 - .99	44	1.50 - 1.59	4
1.00 - 1.09	46	1.60 - 1.69	3

For the above distribution calculate -

(i) the mean

(ii) the standard deviation

(iii) the median

(iv) the co-efficient of variation. (4+6+6+2)=18

2. EITHER

The following data give the production of sweet potatoes in the U.S.A. during the years 1940 - 1952.

year (X) (1)	production (in millions of bushels*) (Y) (2)	year (X) (1)	production (in millions of bushels*) (Y) (2)
1940	51.7	1947	49.6
1941	62.5	1948	43.1
1942	65.5	1949	45.0
1943	71.1	1950	40.8
1944	68.3	1951	28.8
1945	61.3	1952	28.3
1946	60.8		

* (1 bushel is approximately 55 lbs)

* (1 bushel is approximately 55 lbs)

(i) fit a second degree polynomial to the above data.

(ii) find the expected values of the production of sweet potatoes for the years 1945 and 1950. (10+6)= 16

Please turn over

2. OR

The following table shows the frequency distribution of yield (y) of dry bark in ounces and the age (x) in years of 157 cinchona plants.

age in years (x)	dry cinchona bark yield in ounces (y)						total
	4-7	8-11	12-15	16-19	20-23	24-27	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
3 - 4	2						2
5 - 6	3	6	6	1			16
7 - 8	3	7	10	5			25
9 - 10		8	15	10	10		43
11 - 12			12	10	15	5	51
13 - 14			2	4	10	4	20
total	8	21	45	30	35	9	157

(i) calculate the co-efficient of correlation between x and y.

(ii) represent the above data graphically and draw the line of linear regression of y on x on it. (10+6)= 16

3. The table below gives the price and per-capita monthly consumption of ten selected items, for the years 1950 and 1955.

item	price (Rs./mds)		monthly consumption (mds.)	
	1950	1955	1950	1955
(1)	(2)	(3)	(4)	(5)
1. rice	25	32	0.15	0.20
2. wheat	21	29	0.20	0.25
3. potato	15	18	0.10	0.15
4. pulses	30	35	0.05	0.07
5. meat	100	120	0.08	0.06
6. fish	115	135	0.10	0.12
7. milk	28	30	0.12	0.15
8. sugar	40	45	0.05	0.06
9. oil	75	87	0.02	0.03
10. salt	5	6	0.01	0.01

From the data furnished above, calculate Fisher's 'ideal' indexes for both price and quantity for the year 1955, using 1950 as base year. (16)

GROUP B

(Answer all questions from this group)

4. (a) With three variables age (x_1), height (x_2) and weight (x_3) the following three correlation coefficients are reported to have been obtained

$$r_{12} = .3287, \quad r_{13} = .0057, \quad r_{23} = .8130 .$$

Examine if the results can be accepted as free from computational error.

(b) The correlation coefficients of the factors, temperature (t), rainfall (w) and yield (y) of potatoes, based on the results of 20 harvests are given below:

$$r_{yt} = .502, \quad r_{yw} = .004, \quad r_{tw} = -.604 .$$

(i) compute the partical correlation coefficient $r_{yt.w}$.

(ii) obtain the value of the multiple correlation coefficient $R_{y.tw}$.

(5+7+8)=20

Please turn over

5. EITHER

Eight students made the following scores on Test I, Test II and Final Examinations in a certain certificate course :

Test I	Test II	Final Examination
43	22	66
38	20	38
27	23	55
28	33	63
35	20	25
21	8	17
19	17	33
13	19	18

Obtain a linear regression equation of scores in the Final Examination on those in the Tests I and II. (12)

OR

Fit a polynomial of second degree to the following data. Represent the observed and expected values on a graph paper.

year	population (millions)
1891	20.07
1901	22.71
1911	25.07
1921	29.00
1931	32.53
1941	36.07
1951	37.89
1961	30.05

(12)

The number of letters posted in a certain city on each day, during a period of five consecutive weeks, are given below.

sl. no. of week (t)	number of letters posted on different days of the week (in hundreds)							total
	Sun.	Mon.	Tue.	Wed.	Thurs.	Fri.	Sat.	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	18	161	170	154	143	101	76	883
2	18	165	179	157	168	105	85	967
3	21	162	169	153	130	185	82	911
4	24	171	182	170	162	179	95	983
5	27	172	186	180	170	202	120	1057
total	108	831	866	814	782	922	488	4811

Fit a straight line trend to the weekly totals (y) in the form $y = a + bt$ and use the same to obtain the trend values for each day of the week. (18)

INDIAN STATISTICAL INSTITUTE

Computer's Certificate Examination - May 1966

Paper V (Practical) : Elementary Statistical Methods

Time : 5 hours Full marks : 100

(a) Those who have already passed according to the old rules in Part IB Section II or in Part IC Section I will be exempted from answering Group A or B respectively. They should however answer questions from the other two groups (i.e. from B and C or from A and C as the case may be) in time not exceeding 3 hours.

(b) Figures in the margin indicate full marks.

(c) Use of calculating machines is permitted.

GROUP A

(Answer all questions from this group)

The data below, give the frequency distribution of the heights of 800 students, with mean and standard deviation as 167.8 cms. and 4.7 cms. respectively.

height (in cms.)	number of students	height (in cms.)	number of students
(1)	(2)	(1)	(2)
153 - 155	3	167 - 169	135
155 - 157	10	169 - 171	117
157 - 159	12	171 - 173	93
159 - 161	40	173 - 175	78
161 - 163	61	175 - 177	25
163 - 165	98	177 - 179	10
165 - 167	114	179 - 181	4

(i) Fit a normal curve to the above data.

(ii) Draw the histogram of the observed data and the fitted normal curve on the same graph paper. (15+5)=20

2. Answer any two from among the following :

(a) 10 coins were tossed 2048 times. Assuming that both the faces of a coin are equally likely to come up, find out the expected frequencies of getting 0, 4, 5, 7 and 9 heads. (10)

(b) The following table gives the classification of 1725 school children according to the attributes 'intelligence type' and 'standard of dress'. Examine whether the two attributes are associated.

standard of dress	intelligence type			total
	dull	intelligent	very capable	
(1)	(2)	(3)	(4)	(5)
well clothed	222	779	386	1387
poorly clothed	127	163	48	338
total	349	942	434	1725

(10)

(c) In region A, out of 430 persons selected for an enquiry 185 were found to be educated. In region B, however, the number of educated persons was found to be 160 out of 330 selected for the enquiry.

Find out whether there is a significant difference in the percentage of educated persons in the two regions. (10)

Please turn over

3. Given the following data for 10 pairs of values of x and y :

$$\Sigma x = 605 \qquad \Sigma y = 415$$

$$\Sigma x^2 = 38825 \qquad \Sigma y^2 = 16975$$

$$\Sigma xy = 26450$$

Obtain the linear regression equation $y = a + bx$ and test whether the regression coefficient 'b' differs significantly from 0.5. (10)

GROUP B

(Answer both questions from this group)

4. An experiment was conducted on the yields of six varieties of grass, using a 6 X 6 Latin Square design. The yield of dry weight of grass in gms are given below:

A 730	B 1038	D 1017	F 884	E 1254	C 692
D 1154	A 729	B 1064	C 699	F 892	E 1262
C 694	F 887	E 1260	D 1182	A 752	B 1070
F 888	E 1259	C 705	B 1069	D 1194	A 782
B 1065	D 1188	A 764	E 1261	C 720	F 902
E 1260	C 716	F 900	A 700	B 1078	D 1265

Analyse the above data (i) to test if the varieties differ significantly from one another and (ii) to recommend the best variety, if any, with respect to yields. (20)

5. EITHER

From the tables of random numbers supplied -

(a) Select a sample of size 5 with equal probability and without replacement from a population containing 128 units.

(b) Prepare a layout for a Latin Square design, with four varieties.

Give details of the method used and reference to the pages of the Random Number Tables consulted. (5+5)=15

5. OR

Below is furnished a population of 20 units.

unit number (1)	size (2)	unit number (1)	size (2)
1	145	11	85
2	132	12	114
3	211	13	216
4	85	14	185
5	162	15	175
6	90	16	92
7	254	17	88
8	312	18	140
9	105	19	152
10	78	20	177

(i) Select 2 units without replacement and with probabilities proportional to the sizes indicated against them.

(ii) Select by using the table of Random Normal Deviates a sample of 10 units from a normal population having mean 10 and standard deviation 5.

Specify clearly the page and column of the table you make use for this purpose. (7+8)=15

GROUP C

(Treat this question as compulsory)

6. (i) Draw the control limits of the p. chart when $\bar{p}$ = 5% and n = 100.

(ii) The data below give the number of defective items in lots of 1000, inspected on 20 consecutive days in a factory.

date (1)	number of defectives (2)	date (1)	number of defectives (2)
14.2.66	13	24.2.66	12
15.2.66	11	25.2.66	15
16.2.66	15	26.2.66	12
17.2.66	12	27.2.66	15
18.2.66	16	28.2.66	15
19.2.66	25	1.3.66	12
20.2.66	14	2.3.66	27
21.2.66	15	3.3.66	29
22.2.66	10	4.3.66	15
23.2.66	16	5.3.66	10

Examine whether the process is under control or not, by constructing a suitable control chart. (3+12)=15

INDIAN STATISTICAL INSTITUTE

Computer's Certificate Examination - November 1966

Paper I (Practical) : Elementary Computation

Time : 5 hours Full marks : 100

(a) Figures in the margin indicate full marks.
(b) Use of calculating machines is not permitted.

GROUP A

(Answer all questions from this group)

1. (a) Define absolute and relative errors.

(b) Show that if the relative error in the number 71.2834 is less than $1/8 \times 10^{-4}$, the number is correct to 5 significant figures.

(c) Each of the numbers in this fraction

$$\frac{5.03241 \times 3.26 + 0.11895}{0.75995 \times 3.26 + 0.014015}$$

is correct to the last decimal place in it. To how many significant figures is the value of the fraction correct? (2+3+5)=12

2. (a) Find the percentage error involved in approximating :

$(1+k)(1+k^2)(1+k^4)$ by $\frac{1}{1-k}$ for $k = 0.6$

(b) In a rightangled triangle (ADC) the hypotenuse (AB) and one side (BC) are found by measurement to be 75 ft. and 32 ft. respectively. If the possible error in AB is 0.2 ft. and that in BC is 0.1 ft. find the possible error in the sine value of the angle ADC. (6+6)=12

3. (a) Evaluate using short-cut methods

(i) $6^4 + 4^4 + 36 \times 16$

(ii) $(2.5)^2 + (3.5)^2 + (6.5)^2 - 2.5 \times 3.5 - 2.5 \times 6.5 - 3.5 \times 6.5$

(b) Employ contracted method to evaluate $327.3149 \div 26.292331$ correct to two places of decimals (3+3+6)=12

[N.B. : No marks will be given for working by routine processes.]

4. Obtain the values of the following correct to five significant figures -

(i) $Z = \frac{1}{2} \log_e \frac{1+r}{1-r}$ for $r = .63$

(ii) $Y = \frac{(2\cos^2\theta - 1)}{\sin 2\theta}$ for $\theta = .25$ radians

(iii) $t = \frac{r\sqrt{n-2}}{\sqrt{1-r^2}}$ for $n = 20$, $r = .23$ (4+4+4)=12

Neatness (2)

Please turn over

GROUP B

(Answer question 5 and any other three questions from this group)

5. The following table gives for major crop season, cumulative percentage distributions of the number of households (x) and of the area 'owned and self-operated' (y) for different all-India size limits of holdings

All-India size limits of holdings (acres)	Cumulative percentage of the number of households	the area 'owned and self-operated'
(1)	(2)	(3)
0.00	25.24	-
upto 1.00	51.13	1.55
" 2.50	64.29	6.72
" 5.00	76.78	17.24
" 7.50	84.20	27.85
" 10.00	88.59	38.87
" 15.00	93.20	50.04
" 20.00	95.60	59.73
" 25.00	96.93	66.56
" 30.00	97.80	72.31
" 50.00	99.23	84.87
more than 50.00	100.00	100.00

(i) Plot y against x on a graph paper .

(ii) Draw a free-hand curve through the plotted points.

(iii) Draw the line y = x on the same diagram and also the ordinate at x = 100.00

(iv) Estimate the area between the line y = x and the curve you have drawn. Find also the proportion of this area to the area of triangle bounded by the line y=x, x-axis and the ordinate at x = 100.00 (4+4+2+8) = 18

6. The following table gives the values of a function F(a, b) for different values of a and b.

b \ a	60	61	62	63
65	1.34893	1.35695	1.36302	1.37013
66	1.37728	1.38477	1.39233	1.39905
67	1.40600	1.41400	1.42208	1.43022
68	1.34510	1.44382	1.43225	1.46096

Find by using linear interpolation method the value of the function, when a = 61.75 and b = 66.50. (10)

7. Solve graphically -

(i) $4x^2 + 4x - 3 = 0$

(ii) $2x - y = 4$
$x + 2y = 7$ (5+5) = 10

8. Draw the graph

$$y = x^3 + 2x^2 - 5x - 6$$

and find y when x = 2.5 from this graph. (8+2)=10

9. The following table gives the consumption of cotton in some country for the years 1921-1933, excluding the actual figure for the year 1932 as not being available.

Year	Consumption	Year	Consumption
(1)	(2)	(1)	(2)
1921	198	1928	1301
1922	247	1929	1314
1923	326	1930	1180
1924	422	1931	1574
1925	583	1933	2110
1926	606	1934	1948
1927	1000	1935	2527

(i) Plot the figures in a graph paper and draw a free-hand curve through the plotted figures.

(ii) Estimate the consumption figure of cotton for the year 1932. (6+1)=13

Neatness (2)

INDIAN STATISTICAL INSTITUTE

Computer's Certificate Examination - November 1966

Paper II (Practical) : Compilation and Presentation of Statistics

Time : 6 hours Full marks : 100

(a) Figures in the margin indicate full marks.

(b) Use of calculating machines is not permitted.

GROUP A

(Answer all questions from this group)

1. During a sample survey in 1961-62, data relating to wealth of rural households were collected, and the aggregate value of total assets of cultivators, non-cultivators and all rural households were estimated. For a detailed examination of the estimates the rural households were classified under the following seven asset groups (below Rs.500; Rs.500 - 1000; Rs.1000 - 2500; Rs.2500 - 5000; Rs.5000 - 10000; Rs.10000 - 20000; Rs.20000 and above) and the proportion of households in different asset groups and the percentage share of the total wealth for each asset group, were determined. It was found that the households falling in the seven asset groups formed in terms of percentage, 6.3%, 9.7%, 24.8%, 23.3%, 18.0%, 10.7% and 6.4% respectively of the total cultivator households, and 49.4%, 19.3%, 17.4%, 7.1%, 4.1%, 1.6%, and 1.1% respectively of the total non-cultivator households. Further it was observed that the households in the seven asset groups accounted for 0.3%, 1.1%, 6.4%, 12.0%, 10.6%, 22.3% and 37.6% respectively of the total wealth of cultivator households, whereas in the case of non-cultivator households, the corresponding shares of total wealth were 6.9%, 8.4%, 18.2%, 15.3%, 17.3%, 13.1%, and 23.0% respectively.

For all rural households, again, the proportion of households in the asset groups were 17.6, 12.2, 22.9, 19.0, 14.7, 8.3, and 5.3 respectively and the percentages of wealth held by the rural households in the asset groups were 0.8%, 1.7%, 7.1%, 12.8%, 19.4%, 21.6% and 36.6% respectively.

(a) Present the information given above in a suitable tabular form, with appropriate headings and sub-headings.

(b) If you are asked to present similar data also separately for different regions in a single table, indicate (the tabular heads only need be shown) how you would re-arrange the data. (12+3)=15

2. In an education survey by sampling method, information about the sample villages and the primary schools located in them were collected. It was ascertained whether the sampled villages had any primary school within their boundaries and if not, the distance of the nearest primary school from the centre of the village was determined. The distance so recorded, in the schedule varied from 0.5 miles to 3.0 miles.

The information collected in respect of each village primary school included, among others, the total number of students on its roll, the total number of teachers and the number of trained teachers amongst them. The population size of the sampled villages varied from 200 to 3,000. The roll strength of students in individual schools varied from 20 to 80, the number of teachers from 1 to 4 and that of trained teachers from 0 to 3.

Suggest an appropriate tabular layout which will bring out -

(i) proportion of villages having a primary school and those with schools at different distances.

Please turn over

Question 1 (ii) proportion of population living in villages, categorised in (i)

(iii) proportion of trained teachers to all teachers in different schools, categorised in (i)

(iv) number of student per teacher for categories in (i)

(v) distribution of schools by number of teachers and number of students

[You may use one or more tables as you may consider necessary] (10)

3. State the name of the official publications in which the information noted below are available. Indicate also the name of the issuing authority and periodicity of each publication.

(a) Weekly wholesale price quotations of raw cotton, raw jute and oilseeds at important markets of India.

(b) Quantity of rape and mustard seed that moved from U.P. to Calcutta during a year.

(c) Number of primary and secondary schools in different states of India in any year.

(d) Number of constituencies and number of seats allotted for the purposes of representation in the Parliament and in the State Legislatures in India. (10)

4. From the publications on official statistics supplied to you collect information on any three of the following and present them neatly. Indicate also in each case, the name and year of the publication from which you have collected the information, along with the relevant page reference.

(i) Length of National Highways in Madhya Pradesh, Maharashtra, U.P., Andhra Pradesh and Madras for any recent year.

(ii) Production of radio receivers in Maharashtra, West Bengal, and Punjab for three consecutive years.

(iii) Raisings and despatches of coal in India for any three consecutive years.

(iv) Number of Central and State Government employees in India for two consecutive years.

(v) Arrivals of rice and wheat from villages in selected markets in in Maharashtra and Uttar Pradesh in any two consecutive years. (15)

Please turn over

GROUP B

(Answer any three questions from this group)

5. Enumerated figures for the total population and labour force population of India by 1951 census zones, are given in the table below :

1951 Census zones	Census population of India (in lakhs)					
	entire population			labour force population		
	male	female	total	male	female	total
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1. North India	310.6	283.2	593.8	183.2	49.4	232.6
2. East India	428.5	412.5	841.0	250.1	89.5	339.6
3. South India	321.9	335.9	657.8	197.8	96.2	294.0
4. West India	151.2	152.8	304.0	90.1	45.3	135.4
5. Central India	230.5	232.0	471.5	151.7	75.2	226.9
6. North-West India	189.7	162.1	351.8	109.6	39.6	149.2
Total India	1641.4	1578.5	3219.9	982.5	395.2	1377.7

Represent the above data in a suitable diagram, to bring out a zonal comparison of the population of labour force to total population, separately for males, females and their total. (16)

6. Data on per capita consumer expenditure (in rupees) are given in the table below separately for (i) food grains (ii) other food items (iii) non-food items (iv) total $[(i)+(ii)+(iii)+(iv)]$ for Eastern India in 1952, classified by levels of household expenditure.

average household expenditure level	consumer expenditure (in rupees) per household person per week on			
	food-grains (i)	other food items (ii)	non-food items (iii)	total $[(i)+(ii)+(iii)]$ (iv)
(1)	(2)	(3)	(4)	(5)
Rs. 1 - 50	5.80	1.82	2.88	10.50
" 51 - 100	8.68	3.31	4.75	16.74
" 101 - 150	10.60	4.59	7.09	22.28
" 151 - 300	12.88	5.90	9.06	27.84
" 301 - 500	14.76	8.45	16.24	39.45
" 501 -1000	16.06	10.47	28.63	55.16
all levels (Pooled)	10.36	4.63	8.20	23.19

Using the data in the table given above, prepare a suitable statistical diagram or chart to compare the consumer expenditure pattern for the various household expenditure levels. (16)

Please turn over

7. Data on area (in acres) and total population (as in 1951 Census) for a sample of 80 villages in West Bengal, are given below.

village sl. no.	area (acre)	population ('51 census)	village sl. no.	area (acre)	population ('51 census)
(1)	(2)	(3)	(1)	(2)	(3)
1	4892	1663	41	132	193
2	1308	1091	42	771	790
3	4458	700	43	1006	927
4	1188	912	44	1154	808
5	1954	1743	45	182	1702
6	982	704	46	1123	874
7	715	715	47	2282	1253
8	667	1600	48	5099	633
9	4316	3886	49	299	215
10	2882	2414	50	2221	391
11	1857	1141	51	2005	1355
12	1088	851	52	769	399
13	185	515	53	116	277
14	146	959	54	237	163
15	524	1950	55	666	399
16	316	271	56	2646	1007
17	582	525	57	895	536
18	551	437	58	253	498
19	277	804	59	2436	1208
20	594	935	60	462	376
21	252	603	61	368	534
22	339	937	62	758	1585
23	102	468	63	607	801
24	707	409	64	273	719
25	315	431	65	6515	1374
26	184	808	66	211	521
27	648	161	67	885	842
28	1117	400	68	117	261
29	183	719	69	484	156
30	828	210	70	1111	1414
31	134	161	71	282	195
32	798	443	72	273	409
33	447	1332	73	191	182
34	1916	2404	74	572	266
35	1332	1422	75	342	423
36	98	926	76	4855	970
37	2865	4388	77	2708	349
38	3158	3219	78	370	512
39	300	683	79	1087	4254
40	590	733	80	774	1500

(i) For a two way classification of this data suggest appropriate class intervals; 8 for area figures and 6 for population figures.

(ii) Prepare a two-way frequency distribution of the 80 villages using the class intervals in (i). (16)

Please turn over

8. In a study relating to agricultural economics in India, estimates of Gross Capital Formation (G.C.F.) and Net Capital Formation (N.C.F.) are available for the period 1935-36 to 1955-56. The quinquennial (5-year) estimates (in million rupees) are shown in the table below for the asset groups as arranged below (i) implements only, (ii) implements and bullocks, (iii) implements, bullocks and irrigation and (iv) implements, bullocks, irrigation and land.

quinquennial periods	asset groups (i) implements only	(ii) implements and bullocks	(iii) implements, bullocks & irrigation	(iv) implements, bullocks, irrigation and land	total
(1)	(2)	(3)	(4)	(5)	(6)
Gross Capital Formation (GCF): (estimated)					
1935-36 to 1940-41	1061	17043	21298	23241	62646
1940-41 to 1945-46	988	16607	18007	19415	55047
1945-46 to 1950-51	1715	19981	22164	21266	65126
1950-51 to 1955-56	1592	20539	26547	30873	79551
Net Capital Formation (NCF) : (estimated)					
1935-36 to 1940-41	64	1861	3766	5713	11404
1940-41 to 1945-46	- 47	386	373	1810	2522
1945-46 to 1950-51	570	3024	2861	1763	8018
1950-51 to 1955-56	284	1836	5239	9556	16906

Indicate the trend of capital formation by representing the above data in a suitable statistical diagram or chart. (16)

Neatness (2)

INDIAN STATISTICAL INSTITUTE

Computer's Certificate Examination – November 1966

Paper III (Practical) : Selected Techniques of Computation

Time : 5 hours Full marks : 100

(a) Figures in the margin indicate full marks.

(b) Use of calculating machines is permitted.

GROUP A

(Answer all questions from this group)

1. EITHER

Complete the following table

x	y	x^2	y^2	xy	$u = \frac{x-50}{3}$	$v = \frac{y-80}{2}$	u^2	v^2	uv
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
73	84								
66	84								
64	81								
64	85								
69	84								
65	81								
70	85								
64	81								
69	85								
59	80								
Total									

If $T_1, T_2, T_3, T_4, T_5, T_6, T_7, T_8, T_9, T_{10}$ are the totals of columns 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 respectively, verify

$$\frac{10\,T_5 - T_1 \times T_2}{\sqrt{10\,T_3 - T_1^2}\ \sqrt{10\,T_4 - T_2^2}} = \frac{10\,T_{10} - T_6 \times T_7}{\sqrt{10\,T_8 - T_6^2}\ \sqrt{10\,T_9 - T_7^2}}$$

(7+4)=11

Please turn over

1. OR

Complete the following table:

x	y	x^2	y^2	xy	x-y	$(x-y)^2$
(1)	(2)	(3)	(4)	(5)	(6)	(7)
167	180					
120	184					
175	179					
123	131					
187	188					
123	163					
121	171					
175	202					
133	163					
144	173					
109	127					
165	181					
114	182					
164	191					
125	159					
Total						

If T_1, T_2, T_3, T_4, T_5, T_6, T_7 are the totals of columns 1, 2, 3, 4, 5, 6, 7 respectively,

verify,

$$2\,(15\,T_5 - T_1 \times T_2) = (15\,T_3 - T_1^2) + (15\,T_4 - T_2^2) - (15\,T_7 - T_6^2) \qquad (7+4)=11$$

2. Given

x	e^x
.12	1.12750
.13	1.13683
.14	1.15027
.15	1.16183
.16	1.17351

EITHER

From the values given above find $e^{0.1245}$ using an interpolation formula. Also get the true value of $e^{0.1245}$ from tables and determine the error in the interpolated value. (9+3)=12

OR

From the values given above find $e^{0.1595}$ using an interpolation formula. Also get the true value of $e^{0.1595}$ from tables and determine the error in the interpolated value.

Please turn over

3. Given

x	log x
5531	3.74280
5532	3.74288
5533	3.74296
5534	3.74304

From the values given above determine anti-log $\bar{1}.743$. Also get the true value of anti-log $\bar{1}.743$ from tables and determine the error in the interpolated value. (13+2)=15

4. Compute the value of $\int_{4}^{5.2} \log_e x \, dx$ using Simpson's one-third rule with seven ordinates. (12)

GROUP B

(Answer question 1 and any other three questions from this group)

5. Find to three places of decimals the smallest positive root of

$$x^x + 2x = 6 \qquad (17)$$

6. The equation

$$1.23x^5 - 2.52x^4 - 16.1x^3 + 17.3x^2 + 29.4x - 1.34 = 0$$

has a root lying between 0.04 and 0.05. Find the root up to 4 places of decimals.

7. Solve

$$\begin{aligned} 2x_1 - 2x_2 + 4x_3 &= -12 \\ 2x_1 + 3x_2 + 2x_3 &= 8 \\ -x_1 + x_2 - x_3 &= 3.5 \end{aligned} \qquad (11)$$

8. Evaluate

$$\begin{vmatrix} 3 & -1 & 2 & 5 \\ -2 & 3 & 4 & 1 \\ 1 & -3 & 2 & 6 \\ 2 & 4 & 3 & 1 \end{vmatrix} \qquad (11)$$

9. Solve by graphical method -

$$\begin{aligned} 8x + 13y &= 9 \\ x + 8y &= 6 \end{aligned} \qquad (11)$$

INDIAN STATISTICAL INSTITUTE

Computer's Certificate Examination – November 1966

Paper IV (Practical): Descriptive Statistics

Time : 3 hours Full marks : 100

(a) Those who have already passed according to old rules in Part II Section I only, will not be required to answer Group A; but will answer the questions in Group B only, in the time not exceeding 3 hours.

(b) Figures in the margin indicate full marks.

(c) Use of calculating machines is permitted.

GROUP A

(Answer all questions from this group)

1. The following data give the distribution of scores in English of 250 candidates in an examination.

Scores in English (1)	Number of candidates (2)	Scores in English (1)	Number of candidates (2)
15 – 19	9	45 – 49	37
20 – 24	11	50 – 54	26
25 – 29	10	55 – 59	8
30 – 34	44	60 – 64	5
35 – 39	45	65 – 69	1
40 – 44	54	Total	250

Compute the following measures for the distribution above :

i) the mean

ii) the standard deviation (corrected for grouping error)

iii) the median, the first and the third quantiles, the ninetieth percentile

iv) the co-efficient of variation (2+3+6+4)=15

2. The following table shows the distribution of scores in two tests A and B, obtained by a group of 160 school children of grade IV.

B \ A	10–	15–	20–	25–	30–	35–	40–	45–	Total
10 –	1		2						3
15 –	2	3	2	2	2	1			12
20 –	1	5	8	4	5	6		1	30
25 –		2	6	10	12	15	2	2	49
30 –		1	3	7	8	9	4	3	35
35 –				1	4	3	6	4	18
40 –						1	4	3	8
45 –							2	3	5
Total	4	11	21	24	31	35	18	16	160

i) Calculate the co-efficient of correlations between the scores of tests A and B.

ii) Obtain the regression line of score in test A on that in test B. (14+6)=20

Please turn over

3. The table below gives the wholesale prices and quantities produced, of a number of commodities in India.

p = price in Rs. per maund

q = quantity produced in thousand tons

Commodity	1951		1954	
	p	q	p	q
(1)	(2)	(3)	(1)	(3)
Rice	16.87	20,954	16.73	24,209
Jowar	10.09	5,991	11.22	9,092
Bazra	10.07	2,309	11.45	3,555
Ragi	9.45	1,201	10.21	1,778
Wheat	18.60	6,985	16.42	8,539
Barley	20.56	2,330	10.17	2,786
Gram	24.09	3,331	12.30	5,125

Calculate the price-index for the year 1954 with 1951 as base year using

i) Laspeyres index

ii) Paasche index, and

iii) Fisher's "Ideal" index (6+6+3)=15

GROUP B

(Answer all questions from this group)

4. The following mean and standard deviation values (in certain suitable units) and the correlation co-efficients are found for the variables

X_1 = hay-crop seed

X_2 = spring rainfall

X_3 = accumulated temperature

in a certain district, during 20 years.

$M_1 = 28.02$, $M_2 = 4.91$, $M_3 = 594$

$\sigma_1 = 4.42$, $\sigma_2 = 1.10$, $\sigma_3 = 85$

$r_{12} = +0.80$, $r_{13} = -0.40$, $r_{23} = -0.56$

Find the linear regression equation for hay crop on spring rainfall and accumulated temperature. (20)

Please turn over

5. EITHER

The following table gives the dispersion matrix of longitude (X_1), latitude (X_2) and yield (Y).

	Y	X_1	X_2
Y	1786.6	1137.4	592.9
X_1		1934.1	-772.2
X_2			2889.5

Calculate the partial regression co-efficients of Y on X_1 and X_2.

OR (15)

In an experiment on wheat, fertilizers were applied at various levels with resulting yields (in suitable units) as follows :-

Fertilizer level (X)	0	5	10	15	20	25	30	40	60
Yield (Y)	26.2	31.1	34.0	35.3	36.3	37.1	37.8	38.6	38.9

Fit the equation

$$Y = 39 - e^{a+bX},$$ to the above data.

Plot the observed data and draw the fitted curve on the same graph paper.

6. The records of Quarterly sales in a Departmental Store in Calcutta, are given below for the period 1960-63.

(Sales in thousands of rupees)

Quarters	Years			
	1960	1961	1962	1963
(1)	(2)	(3)	(4)	(5)
Q_I	152	169	142	183
Q_{II}	233	272	290	299
Q_{III}	362	393	418	429
Q_{IV}	279	289	315	318

Calculate the Seasonal Index Numbers for 'Sales'. (15)

INDIAN STATISTICAL INSTITUTE

Computer's Certificate Examination - November 1956

Paper V (Practical) : Elementary Statistical Methods

Time : 5 hours Full marks : 100

(a) Those who have already passed according to the old rules in Part I3 Section II or in Part IC Section I will be exempted from answering Group A or B respectively. They should however answer questions from the other two groups (i.e. from B and C or from A and C as the case may be) in time not exceeding 3 hours.

(b) Figures in the margin indicate full marks.

(c) Use of calculating machines is permitted.

GROUP A

(Answer all questions from this group)

1. The following frequency distribution has a mean and a standard deviation equal to 20.14 and 2.91 respectively.

i) Fit a normal curve and draw the fitted curve and the histogram of the observed distribution on the same graph paper.

ii) Calculate the expected frequencies and test for goodness of fit

class intervals	frequency	class intervals	frequency
(1)	(2)	(1)	(2)
9 - 11	2	21 - 23	222
11 - 13	4	23 - 25	120
13 - 15	31	25 - 27	38
15 - 17	108	27 - 29	6
17 - 19	210	29 - 31	3
19 - 21	276	Total	1020

(12+13)=25

2. EITHER

The following distribution of pages according to printing mistakes was found in the first proof of a dictionary of 500 pages

number of printing mistakes per page	0	1	2	3	4	5	Total
frequency	280	150	55	7	5	3	500

On the basis of Poisson distribution, find out the expected number of pages with

0, 1, 2, 3, 4, 5, 6 and above

misprints per page, in the first proof of a dictionary of 1000 pages. (10)

OR

Two independent random samples of 10 and 8 units were drawn and the following values were observed for the characteristic under investigation.

Sample I : 6 8 15 10 7 4 12 8 6 13

Sample II : 7 12 3 4 6 8 9 14

Examine whether the difference between the two sample means is significant or not.

Please turn over

3. The following data give the height (x) in centimetres and weight (y) in kilogrammes of 10 persons

Person	1	2	3	4	5	6	7	8	9	10
Height(x) in cms.	183	168	178	153	160	170	177	180	172	174
Weight(y) in kgs.	78	65	75	60	60	64	71	72	66	67

Calculate the linear regression equation of weight(y) on height (x) and test whether the regression co-efficient is significantly different from zero. (15)

GROUP B

(Answer all questions from this group)

4. (a) Select at random a sample of size 5, with replacement from a population containing 193 individuals.

(b) Select three districts from the following list of five districts (with probability proportional to the number of villages and sampling without replacement)

district	number of villages
1	180
2	240
3	140
4	170
5	220

(c) Distribute at random 4 varieties over 4 plots - one variety for each. Give details of the methods used and references to the pages and columns of the Random Numbers Table consulted.

(5+8+2)=15

5. The table below records the yields of six varities(v_i) of barley in five randomised blocks

blocks	yields (in bushels)					
	v_1	v_2	v_3	v_4	v_5	v_6
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1	81.0	105.4	119.7	146.6	103.1	90.1
2	82.3	110.6	125.7	150.0	105.6	92.6
3	81.4	111.2	125.7	151.2	100.2	94.4
4	80.0	103.4	115.4	144.6	101.0	92.3
5	76.2	118.6	116.2	145.0	100.6	91.4

Make an analysis of the data for;

i) testing whether the varieties differ from one another in their yields.

ii) recommending the best variety of barley, if any. (20)

Please turn over

GROUP C

(Treat this question as compulsory)

6. Given the following data regarding the number of 'defectives' among the number of items inspected for 10 days in a factory.

date	number inspected	number of 'defectives'
(1)	(2)	(3)
31.1.66	402	11
1.2.66	310	10
2.2.66	500	18
3.2.66	510	20
4.2.66	525	24
5.2.66	500	18
6.2.66	615	14
7.2.66	660	42
8.2.66	575	45
9.2.66	525	49

Examine whether the process is under control. (17)