

INDIAN STATISTICAL INSTITUTE

QUESTION PAPERS

for

The Computer's Certificate Examination

February & September 1956

INDIAN STATISTICAL INSTITUTE
COMPUTER'S CERTIFICATE EXAMINATION, FEBRUARY 1956

PART IA : SECTION I

Time : 3 Hours

Full Marks : 100

- (a) Answers to the different groups are to be given in separate books.
 (b) Attempt ANY TWO questions from each group.
 (c) All questions carry equal marks.
 (d) Use of Calculating machines is not permitted.

GROUP A

1. (a) Find the value of

$$p^3 + 5p^4q + 10p^3q^2 + 10p^2q^3 + 5pq^4$$

where $p = \frac{2}{3}$ and $q = \frac{1}{3}$ and verify that the result is $1 - q^3$.

- (b) Evaluate

(i) $S_1 = 1 + 2 + \dots + 10$

(ii) $S_1 = \left(\frac{1-S_1}{10}\right)^2 + \left(2 - \frac{S_1}{10}\right)^2 + \dots + \left(10 - \frac{S_1}{10}\right)^2$

when S_1 is obtained from (i).

2. Copy the following primary schedule received from a factory, after making appropriate correctness:—

Date	No. of sections working on the date	No. of workers			Percentage female/male
		male	female	total	
Jan. 1	20	137	67	204	4.89
11	20	140	161	201	43.8
21	02	1132	70	202	53.0
31	19	120	06	126	50.0
Feb. 1	200	042	70	218	53.5
11	18	120	02	182	145.01
31	117	145	152	197	35.0

3. Represent in a suitable tabular form the following data relating to the students attending an educational institution during a particular session :—

Sl. No.	Course	Class	Sex	Day/ Evening	No. attending daily
1	A	1st year	Men	Day	48
2	B	3rd year	Women	Evening	23
3	A	2nd year	Men	Day	52
4	B	2nd year	Women	Evening	20
5	A	1st year	Women	Day	35
6	B	3rd year	Men	Evening	50
7	A	3rd year	Men	Day	49
8	B	1st year	Women	Evening	24
9	A	3rd year	Women	Day	40
10	B	1st year	Men	Day	78
11	A	2nd year	Women	Day	30
12	B	2nd year	Men	Day	70
13	A	1st year	Men	Evening	28
14	B	1st year	Women	Day	73
15	A	2nd year	Men	Evening	36
16	B	3rd year	Men	Day	75
17	A	3rd year	Men	Evening	29
18	B	3rd year	Women	Day	69
19	A	1st year	Women	Evening	13
20	B	2nd year	Women	Day	69
21	A	2nd year	Women	Evening	15
22	B	1st year	Men	Evening	62
23	A	3rd year	Women	Evening	11
24	B	2nd year	Men	Evening	48

GROUP B

4. In a certain State, there were, 149, 170 and 191 primary co-operative credit societies during the three years 1949-50, 1950-51 and 1951-52 respectively, with the number of members of the societies 57,353, 1,07,226 and 1,25,333 respectively. The total owned funds of the societies increased from Rs. 13.22 lakhs in 1949-50 to Rs. 30.99 lakhs in 1950-51 and to Rs. 44.20 lakhs in 1951-52. The working capital of the societies, composed of owned funds and borrowed funds, stood at Rs. 16.88 lakhs, Rs. 35.29 lakhs and Rs. 51.45 lakhs respectively during the three years. Calculate the owned funds per member and the borrowed funds per society for each of the three years and arrange the data in a tabular form.

5. The deposits of 30,000 depositors in a commercial bank was classified according to size of deposit and the following results were obtained :—

Size of deposit	Proportion of depositors (per cent)	Number of depositors
(1)	(2)	(3)
Less than Rs. 100	15.51	
Rs. 100 to Rs. 200	36.42	
Rs. 200 to Rs. 300	28.31	
Rs. 300 to Rs. 500	12.42	
Rs. 500 to Rs. 1000	5.21	
Rs. 1000 to Rs. 2000	2.13	
	100.00	

Fill up column (3) in the above table. Assuming that the deposits are concentrated at the middle points of the above class intervals, namely at Rs. 50, Rs. 150, Rs. 250, Rs. 400, Rs. 750 and Rs. 1500, calculate the total deposits in the bank

6. From the extract reproduced below (omitted the punctuation marks), prepare a table showing the number of words possessing one, two, three, etc., letters :—

'The world economy displayed, on the whole, remarkable strength during the year, which was characterised by a marked rise in industrial and agricultural production, a fair degree of price stability and continued improvement in balance of payments, particularly with the dollar area; the year witnessed the flexible use of monetary policy of the relaxation of monetary restraints, inflation having been successfully eliminated in many countries.'

What proportion of the words in the above extract contain (i) seven or more letters, and (ii) three or less letters ?

COMPUTER'S CERTIFICATE EXAMINATION, FEBRUARY 1956

PART IA : SECTION II

Time : 3 hours

Full Marks : 100

- (a) Answers to the different groups are to be given in separate books.
 (b) Attempt ANY TWO questions from each group.
 (c) All questions carry equal marks.
 (d) Use of Calculating machines is not permitted.

GROUP A

1. Represent graphically on separate sheets :—

(a) $3x^2 + 5x - 24 = y$

(b) $x^2 - 9x = 8y$

and measure in each case the area contained between the curve and the line :

$y = 0$ and $y = 20$.

2. Evaluate

$$\sum_{x=1}^{10} \frac{8x^2(x+1)^2}{4} - \frac{9x(x+1)(2x+1)}{6} + \frac{31x(x+1)}{2} - 30x$$

where Σ stands for summation.

3. Represent graphically the following figures which show, in thousands of maunds, the import of raw jute into Calcutta from Indian sources.

Calculate also the average import per month during the period July 1954 to June 1955 and July to December 1955.

Months	Imports in '000 maunds	
	1954-1955	1955
July	995	796
August and September	2402	2343
October	2230	2133
November	3233	3031
December	3057	3033
January, February & March	6193	
April and May	2524	
June	804	

GROUP B

4. (a) Solve the equation,

$$323x^2 + 50x = 234.$$

- (b) Find by contracted multiplication the value of :—

$$267.6846 \times 378.9286 \text{ correct to 3 decimal places.}$$

5. Calculate the mean and the standard deviation of the following measurement in inches :—

103, 109, 107, 119, 112, 99, 99, 127, 125, 131, 107, 123, 149, 111, 97
 111, 97, 111, 110, 134, 92, 150, 135, 121, 133, 109, 114, 109, 110, 112
 125, 118, 101, 112, 125, 136, 89, 125, 118, 103, 127, 119, 134, 133, 129,
 138, 125.

6. (a) Logarithms of certain numbers are given below from which find by simple interpolation :—

- (i) the logarithm of 572 and
 (ii) the number, the logarithm of which is 2.76896.

Number	Logarithm
550	2.74036
560	2.74819
570	2.75587
580	2.76343
590	2.77085
600	2.77815

- (b) The production of coal of a country for the years 1925 to 1932 is given below. If the production for the year 1928 is taken as the base, what would be the indexes (indices) of production for the years 1925, 1929 and 1932. If it is known that the index of production for the year 1937 is 98.62 with the same base, what is the actual production of that year.

Year	Production (in million tons)
1925	520.1
1926	573.4
1927	517.8
1928	500.7
1929	535.0
1930	467.5
1931	382.1
1932	309.7

COMPUTER'S CERTIFICATE EXAMINATION, FEBRUARY 1956

PART IB : SECTION I

Time : 3 Hours

Full Marks : 100

- (a) Answers to the different groups are to be given in separate books.
 (b) All questions carry equal marks.
 (c) Intermediate steps in the computation should be shown.
 (d) Use of Calculating machines is permitted.

GROUP A

1. The following data give information collected in a crop-cutting experiment conducted in 50 fields :-

Sl. No. of sample cut	Field size (in acres)	Irrigation type code	No. of plants in cut	Weight of green paddy in mds. per acre
(1)	(2)	(3)	(4)	(5)
1	.12	2	132	12.2
2	.35	3	127	10.3
3	.07	1	87	13.5
4	.19	1	104	12.6
5	.06	3	147	28.6
6	.45	2	120	31.9
7	.03	1	143	20.3
8	.36	2	148	15.0
9	.09	3	162	12.1
10	.32	3	155	21.7
11	.16	2	123	25.2
12	.10	1	146	23.4
13	.03	3	143	16.2
14	.22	2	194	30.1
15	.38	1	137	21.1
16	.15	3	127	10.2
17	.07	2	135	27.8
18	.65	1	140	24.7
19	.08	2	123	19.9
20	.45	3	113	10.9
21	.29	1	142	27.9
22	.08	2	118	19.0
23	.39	1	118	30.9
24	.42	3	152	22.7
25	.49	2	146	25.4
26	.32	1	129	22.7
27	.18	3	120	37.6
28	.06	2	130	25.7
29	.04	3	138	25.4
30	.26	1	160	27.5

(1)	(2)	(3)	(4)	(5)
31	.10	3	136	19.0
32	.24	2	136	20.4
33	.25	1	156	22.6
34	.22	3	178	18.0
35	.20	1	163	30.8
36	.34	2	143	21.1
37	.07	3	138	17.3
38	.29	1	135	31.2
39	.37	2	133	22.8
40	.27	3	128	17.5
41	.40	2	141	29.9
42	.20	1	117	22.1
43	.05	3	137	18.8
44	.34	2	145	21.8
45	.19	1	130	34.1
46	.30	2	130	26.4
47	.28	1	109	28.7
48	.10	3	128	21.7
49	.31	1	121	25.1
50	.30	2	201	17.3

Obtain for each type of irrigation the mean and the standard deviation of (i) weight of green paddy in maunds per acre, and (ii) number of plants per cent.

Or,

Calculate the mean, standard deviation β_1 and β_2 of size of field.

2. Find out (i) the coefficient of correlation between weight of green paddy in maunds per acre (y) and number of plants per cut (x), and (ii) the equation for linear regression of y on x .

GROUP B

3. The following table gives the average consumption y of petrol in gallons per month and the total number x of passengers carried by the buses of the Bombay Stage Transport in the various regions during the years 1950-51 and 1951-52:—

Division.	1950-51		1951-52	
	x	y	x	y
Ahmedabad	47,21,548	14,340	52,00,743	7,761
Nadiad	90,18,481	17,767	93,11,137	6,983
Ratnagiri	11,57,450	1,688	22,11,006	2,275
Bombay	28,52,098	15,838	83,23,906	23,113
Nasik	58,87,563	13,216	76,52,010	20,851
Kolhapur	54,71,434	10,072	76,46,200	17,312
Sholapur	55,56,493	30,770	69,05,936	23,242
Poona	85,22,613	31,569	84,90,110	31,347
Bijapur	60,72,075	27,664	74,15,427	30,105
Belgaum	54,05,042	24,613	46,43,316	15,468

Analyse the variations in the number of passengers carried per gallon of petrol ($x/12y$) into appropriate components.

4. Find five-year moving averages for the following series of index number of wages of browers in coal mining with the year 1900 as base. Plot the original data and the moving averages :—

Year	Index No.	Year	Index No.
1876	71	1891	87
77	66	92	79
78	62	93	80
79	62	94	76
80	61	95	73
1881	63	1896	72
82	68	97	73
83	69	98	79
84	66	99	84
85	63	1900	100
1886	61	1901	94
87	61	02	88
88	65	03	85
89	76	04	82
90	86	05	81

Or,

Fit a second degree parabola by the method of least squares to the following data :—

Consumption of Rayon
(1921-1935)

Year	Consumption (in suitable units)
1921	198
1922	247
1923	326
1924	422
1925	583
1926	666
1927	1000
1928	1001
1929	1314
1930	1180
1931	1374
1932	1520
1933	2119
1934	1948
1935	2527

COMPUTER'S CERTIFICATE EXAMINATION, FEBRUARY 1958

PART IB : SECTION II

Time : 3 Hours

Full Marks : 100

- (a) Answers to the different groups are to be given in separate books.
 (b) Attempt ANY TWO questions from Group A and all questions from Group B.
 (c) Figures in the margin indicate full marks.
 (d) Use of Calculating machines is permitted.

GROUP A

1. (a) Find the ordinates of the curve

$$y = 100 \left(1 - \frac{x}{10} \right) \cdot 25$$

at $x = 0, 1, 2, 3, 4$ and 5 .

- (b) The results of three different examinations are summarized in the following table:—

	Examination 1	Examination 2	Examination 3
Passed	21	13	12
Failed	32	20	23

Use the X^2 -test to investigate whether there are significant differences between the proportions of successful candidates in the three examinations.

- (c) The viscosity of a certain liquid was determined 100 times by each of two methods A and B. The results are given below:—

Method	Number of experiments	Mean	S.D.
A	100	16.18	.23
B	100	16.44	.32

Test for significance of the difference between the two means (25)

2. The following data relate to the number of whole-life policies in a certain Company grouped according to the attained age of the life assured :

Nearest age	Number of policies
20—24	25
25—29	52
30—34	80
35—39	186
40—44	308
45—49	507
50—54	605
55—59	707
60—64	783
65—69	707
70—74	621
75—79	455
80—84	222
85—89	96
90—94	62
95—99	4
Total	5384

If a normal curve is fitted to the above frequency distribution, what would be the expected frequencies in the classes :

$$20-24, 30-34, 40-44, 50-54, 60-64, 70-74, 90-94 ? \quad (25)$$

3. The following table gives the values of a function $F(x,y)$ for different values of x and y .

$x \backslash y$	0.0	0.1	0.2	0.3
0.0	.3976	.3766	.3538	.3204
0.1	.3766	.3583	.3380	.3162
0.2	.3538	.3380	.3204	.3011
0.3	.3204	.3152	.3011	.2843

Find by linear interpolation the value of $F(x,y)$ when

- (i) $x = 0.08, y = 0.175$
(ii) $x = 0.234, y = 0.257$
(iii) $x = 0.15, y = 0.15$
(iv) $x = 0.175, y = 0.08$ (25)

GROUP B

4. Draw up the appropriate tabular form which you will use for compiling the following items of information. (Actual figures need not be collected). Mention the publications you will consult in each case :

- (i) Death rates for the following diseases in India for the years 1946, 1947, 1948, 1949 and 1950.

(a) Cholera, (b) Small Pox, (c) Respiratory diseases.

(ii) Number, membership and share-capital of co-operative societies in India for the years 1947-48, 1948-49, 1949-50, 1950-51 and 1951-52.

(iii) Average rates charged per passenger per mile for different classes in Indian Railways for the years 1949-50, 1950-51, 1951-52 and 1952-53.

(iv) Notes in circulation, notes held in Banking departments and total notes issued for the first six months of the year 1955. (18)

5. (i) The following data relate to monthly salary rates of U.S. engineers by years of experience in 1946. Represent the data graphically and write a critical note on the same. (16)

Monthly salary rates of engineers, by years of experience, 1946

Years of experience	Chemical	Mechanical	Electrical
Less than 1	242	220	228
1	241	225	237
2	255	264	249
3	278	285	277
4	310	308	303
5	327	342	315
6	344	360	325
7-8	375	380	347
9-11	399	408	366
12-14	452	442	409
15-19	474	455	418
20-24	552	492	454
25-29	598	518	502
30-34	655	514	513
35-39	640	534	545
40 & over	680	520	509

(ii) Represent the following data in a suitable graphical form and comment briefly. (16)

Electric energy sold (in million of kilo-watt hours)

Month	Domestic consumption		Commercial		Industrial power	
	Heat and power	Light and fans	Heat and small power	Light and fans	Low and medium voltage supply	High voltage supply
June 1954	11.4	50.2	12.8	24.9	63.0	282.0
July 1954	11.2	51.1	11.5	26.0	63.8	274.8
Aug. 1954	11.7	53.2	10.8	26.4	65.7	273.1
Sept. 1954	11.8	53.2	10.6	26.8	65.2	279.4
Oct. 1954	11.3	52.4	10.3	25.0	63.6	273.0
Nov. 1954	11.4	52.0	11.1	24.1	64.3	280.9
Dec. 1954	11.3	51.9	11.7	24.5	66.8	304.1
Jan. 1955	11.0	51.1	12.0	24.3	67.4	295.1
Feb. 1955	10.9	49.9	11.6	23.5	65.8	280.9
Mar. 1955	11.5	51.8	12.9	25.8	70.7	304.8
Apr. 1955	11.2	51.4	18.6	25.0	70.1	298.8
May 1955	11.5	52.7	12.9	26.8	71.8	305.4

COMPUTER'S CERTIFICATE EXAMINATION, FEBRUARY 1956

PART IC : SECTION I

Time : 4 Hours

Full Marks : 100

- (a) Answers to the different groups are to be given in separate books.
 (b) Figures in the margin indicate full marks.
 (c) Use of Calculating machines is permitted.

GROUP A

1. Find by graphical methods, to two places of decimal the root of the equation

$$x^3 - 2x - 5 = 0, \text{ given that the root lies between 2 and 3. } \quad (20)$$

Or,

Taking $\sqrt{2\pi m} m^m e^{-m}$ as an approximation for $m!$, prepare a table showing comparison of the logarithms of $m!$ with their approximations for $m = 5, 10, 15, 20, 25$, and 50. (20)

2. Fit a cubic of the form

$$y = a + bx + cx^2 + dx^3$$

to the following census figures and estimate the population for the year 1898.

Year (x)	Population (y) (millions)	Year (x)	Population (y) (millions)
1811	10.16	1881	25.97
1821	12.00	1891	29.00
1831	13.00	1901	32.53
1841	15.91	1911	36.07
1851	17.93	1921	37.89
1861	20.07	1931	39.95
1871	22.71		

(30)

GROUP B

3. The following table gives the breaking strength (y) and thickness (x) for three kinds of starch films :

Wheat x	Starch y	Rice x	Starch y	Corn x	Starch y
5.0	263.7	7.1	556.7	8.0	731.0
3.5	130.8	6.7	552.5	7.3	710.0
4.7	382.9	5.6	397.5	7.2	604.0
4.3	302.5	8.1	532.3	6.1	58.8
3.8	212.3	8.7	587.8	6.4	393.0
3.0	132.1	8.3	520.9	6.4	416.0
4.2	292.0	8.4	574.3	6.9	400.0
4.5	315.5	7.3	505.0	5.8	335.6
4.3	262.4	8.5	604.6	5.3	306.4
4.1	314.4	7.8	522.5	6.7	426.0

By analysis of covariance, test for the significance of the differences in the breaking strength between different kinds of starch after eliminating the effect of thickness.

(25)

4. The following table gives the values of three correlated variables x_1 , x_2 , and x_3 measured on 20 individuals.

Serial No.	x_1	x_2	x_3
1	607	389	429
2	639	380	441
3	617	397	442
4	633	380	437
5	643	402	450
6	640	393	441
7	609	397	441
8	629	374	437
9	632	384	437
10	642	394	449
11	607	397	437
12	635	382	438
13	623	377	425
14	630	392	427
15	634	379	442
16	644	399	446
17	607	399	445
18	638	832	439
19	641	382	441
20	630	397	439

(i) Find the equation of the regression line of x_3 on x_1 .

(ii) Find the partial correlation coefficient between x_3 and x_2 eliminating effect of x_1 and test for its significance.

(25)

COMPUTER'S CERTIFICATE EXAMINATION, FEBRUARY 1956

PART IC : SECTION II

Time : 4 Hours

Full Marks : 100

- (a) Answers to the different groups are to be given in separate books.
 (b) Figures in the margin indicate full marks.
 (c) Use of Calculating machines is permittend.

GROUP A

1. Find the co-factors of all the elements of the following determinant :—

7522	4728	7594	(15)
6545	4119	5784	
2440	2854	9205	

2. The following data show the distribution by age at marriage of a sample of male population :

Age (years)	Frequency ..	Age (yrs.)	Freyquency
6—10	39	31—35	292
11—15	299	36—40	130
16—20	1832	41—45	57
21—25	2872	46—50	29
26—30	1247	51—55	12

- (a) Detormine the appropriate type of Pearsonian curve which will fit the above data and evaluate the constants involved.

- (b) Find out expected frequencies in the age-groups 26—30 and 31—35. (35)

Or,

The following data show the number (in thousand) of cheques cleared through the banks in India during different months :

Month \ Year	1951	1952	1953	1954
January	2257	2394	2574	2794
February	2203	2314	2445	2721
March	2143	2358	2713	3409
April	2348	2418	2736	2961
May	2356	2482	2635	2821
June	2134	2236	2465	2582
July	2641	2708	2711	2901
August	2153	2274	2341	2708
Septombor	2109	2360	2563	2910
October	2515	2538	2577	2554
November	2382	2401	2550	3067
Decombor	2396	2540	2880	2993

Calculate the seasonal indices.

(35)

GROUP B

3. If you were to collect the items of information given below, state: (1) complete names of the publications containing the information, (2) the authorities who issue them and (3) the places where they are available for (a) sale and (b) reference: (Give answer in tabular form).

1. Yield of rice in Indian Union for 1952.
2. Number of factories in different States of Indian Union in 1949.
3. Number of industrial disputes in India during the period 1949-1954.
4. Export from Indian Union of mica during 1950
5. Average number of workers per day employed in Indian coal mines in 1950.
6. Number of educational institutions in the Indian Union during 1949-50.
7. Index numbers of value of retail trade in food items in Belgium for 10 consecutive months in 1954-55.
8. Average monthly sea-borne goods loaded (by weight) by France in 1954.
9. Average monthly passenger-miles in civil aviation in India in 1954.
10. Export of Indian tea by sea during 1949-52. (20)

4. The following table gives the results of an 8×8 Latin square experiment involving treatments A, B, C, D, E, F, G, H.

Draw up the analysis variance table and test whether the treatments are significantly different among themselves.

B	A	E	C	G	D	H	F
28	22	23	25	21	21	20	28
A	G	F	H	B	C	E	D
22	17	27	27	29	22	20	25
G	E	A	B	D	H	F	C
20	27	20	28	19	26	27	24
F	C	H	D	A	E	B	G
23	22	24	22	21	24	26	26
E	D	G	A	F	B	C	H
27	22	23	21	26	25	20	26
C	F	D	E	H	A	G	B
24	28	22	27	25	19	18	30
H	B	C	F	E	G	D	A
29	23	21	27	27	18	20	24
D	H	B	G	C	F	A	E
27	30	30	26	26	28	23	33

(30)

INDIAN STATISTICAL INSTITUTE
COMPUTER'S CERTIFICATE EXAMINATION, SEPTEMBER 1956

PART IA : SECTION I

Time : 3 Hours

Full Marks : 100

- (a) Answers to the different groups are to be given in separate books.
- (b) Attempt ALL the questions from each group.
- (c) All questions carry equal marks.
- (d) Use of Calculating machines is not permitted.

GROUP A

1. The following data relate to sex (m = male, f = female), religion (H = Hindu, M = Muslim, C = Christian, R = Rest) and marks in English of a group of 60 candidates appearing at a certain school final examination :—

mH 32	mH 47	fM 43	mC 51	mM 20	fH 39	mH 18	mR 63	mH 64	mH 55
mH 54	fC 33	mM 31	fH 46	fC 37	mR 69	mH 56	fC 43	fH 13	mM 60
fM 38	fH 26	mM 50	mH 40	mC 42	mH 35	fR 12	mC 53	mH 15	fM 23
mR 44	mH 21	fM 45	fC 22	mH 41	mC 48	fH 57	fR 27	fC 10	mH 27
mH 68	fM 41	fH 30	mC 52	fH 60	mM 62	mH 58	mR 24	mH 65	mH 39
fC 23	mR 74	fM 34	mH 15	fC 20	fH 38	mH 25	mH 36	mM 46	mR 55

- (a) Arrange the marks in ascending order of magnitude.
- (b) A candidate is considered to have secured first division mark, if he scores 60 or more; second division mark, if he scores 50 or more but less than 60 and third division mark if he scores 40 or more but less than 50 and one who gets less than 40 is considered to have failed. Find the percentage of students scoring second division mark as well as their average score.
- (c) Is the percentage of successful candidates greater than that of failures ?
- (d) Find out the respective divisions in which the candidates securing 1st, 11th, 21st and 31st positions from the top are placed.

2. In a farm of 12 plots with a total area of 37.5 acres, a total yield of 382.15 mds. of paddy was obtained. The following table was completed by a computer, in which the area in acres, total yield of paddy in mds., yield rate in md./acro and squares of these yield rates are given for these 12 plots harvested. Scrutinise the table carefully and prepare another table after correcting the obvious mistakes.

Serial no. of the plot	Area in acres	Total yield in mds.	Yield rate in mds./acre	Square of col. (4)
(1)	(2)	(3)	(4)	(5)
1	3.5	42	14.0	1.9600
2	55	44	8.0	6.4000
3	2.0	230	11.5	121.2500
4	2.5	24	10.0	1000.0000
5	4.0	360	9.0	810.0000
6	4.5	4.50	10.0	1000.0000
7	3.0	39	13.0	16.9000
8	5.0	625	12.5	144.2500
9	3.0	29.4	98	98.0400
10	0.5	5.25	10.5	110.2500
11	2.0	140	7.0	490.0000
12	20	17	8.5	72.2500
Total	37.5	382.15	—	—

GROUP B

3. Complete the missing entries in the following table :—

a	b	$(a-b)$	$(a+b)$	a^2	b^2	(a^2+b^2)	$(a+b)^2$
1.7		-1.1					
2.8		+1.7					
1.9		-0.6					
2.7		+1.2					
3.6		+2.1					
2.8		+1.0					

Total

What will be the value of Σab (the sum of products ab) ?

Or,

Tabulate the values of $y = 2.7 + 3x + x^2$ for values of $x = 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8$ and 0.9 .

4. Group the data of Q. 1 under the different sex x religion classifications. Show in a suitable tabular form the number of candidates and the total of their marks for each of these classifications.

COMPUTER'S CERTIFICATE EXAMINATION, SEPTEMBER 1956

PART IA : SECTION II

Time : 3 hours

Full Marks : 100

- (a) Answers to the different groups are to be given in separate books.
 (b) Attempt ANY TWO questions from each group.
 (c) All questions carry equal marks.
 (d) Use of Calculating machines is not permitted.

GROUP A

1. (a) Solve $15x^2 - 52x - 84 = 0$.
 (b) Find by contracted multiplication the value of $12.648179 \times 374.159863$ correct to 3 places of decimal.
 (c) With the help of tables supplied, find the values of
 (i) $\log 871$, $\log 8.71$ and $\log 0.0871$
 (ii) $\sqrt{76825225} - \sqrt[3]{98611128 - 6275}$.

2. (a) Logarithms of certain numbers are given below:—

Number	Logarithm
110	2.04139
112	2.04922
114	2.05690
116	2.06446
118	2.07188
120	2.07918

- (i) Find by simple interpolation the logarithm of 115.2;
 (ii) Find the number, the logarithm of which is 2.06954; and
 (iii) Find the value of $\log 0.00012$.

(b) Values of imports of a country for the years 1941 to 1950 are given below. Assuming the value of imports for the year 1945 as base, calculate the indices of the values of imports for the years 1942, 1947 and 1949 respectively. If it is known that the index of the values of imports of the years 1939 and 1953 are 87.68 and 125.16 respectively with the same base, calculate the actual values of the imports of these two years.

Year	Value of imports (in lakhs of rupees)
1941	678.1
1942	823.4
1943	787.2
1944	842.6
1945	794.8
1946	580.7
1947	692.4
1948	879.5
1949	927.8
1950	1080.9

3. Two research workers A and B each had carried out measurements of length of a rare item in two parts of a country. Original records of 20 measurements taken by A and the mean of 100 measurements by B in the same units are given below.

Calculate the mean length from the data obtained by combining the two sets of results of experiments carried out by A and B and find out the s.o. of the mean length as obtained by A.

Measurements recorded by A:—

12154, 12160, 12158, 12170, 12163, 12150, 12174, 12150, 12158, 12162, 12148, 12162, 12161, 12148, 12165, 12163, 12168, 12163, 12151 and 12169.

Results obtained by B: N = 100. Mean = 12150.4.

GROUP B

4. Represent graphically the following frequency table:

Monthly wage (in Rs.)	Men	Women	Children	Total
50—55	100	21	18	148
55—60	112	14	30	156
60—65	163	32	15	210
65—70	221	26	10	257
70—75	185	18	5	208
75—80	103	11	—	114
80—85	72	1	—	73
85—90	36	—	—	36
90—95	22	—	—	22
95—100	10	—	—	10

5. Compute the values of:—

$$5x^4 + x^2y - 2x^2y^2 + 7xy^3 - y^4$$

for the following combinations of x and y

(i) $x = 1, y = 3.1$

(iii) $x = 2, y = 3.2$

(ii) $x = 2, y = 3.1$

(iv) $x = 3, y = 3.1$

(v) $x = 3, y = 3.2$

6. (a) Represent graphically the curve

$$y = x^2$$

for both positive and negative values of x and measure the area contained between the curve and the line

$$y = 8 - 3x$$

(b) The following table indicates the volume of sale of a commodity on 1st July of the years 1941 to 1950. Represent the table graphically. Draw a smooth curve through the plotted points and estimate from the curve and volume of sale on 1st January for the years 1949 and 1950.

On 1st July	1941	1942	1943	1944	1945
Sale (tons)	6.7	3.0	2.8	1.8	2.6
On 1st July	1946	1947	1948	1949	1950
Sale (tons)	2.6	5.6	7.5	10.6	16.0

COMPUTER'S CERTIFICATE EXAMINATION, SEPTEMBER 1956

PART IB : SECTION I

Time : 3 Hours

Full Marks : 100

- (a) Answers to the different groups are to be given in separate books.
 (b) Attempt ALL questions from Group A and TWO questions from Group B.
 (c) Figures in the margin indicate full marks.
 (d) Use of Calculating machines is permitted.

GROUP A

1. (a) Present the following data of a note on exports of U.S. merchandise and of imports for consumption, segregated into certain classes, in a tabular form, with an appropriate title.

'Comparing 1936 and 1937, the total value of exports was \$2,418,969,000 in 1937 and \$3,294,016,000 in 1936, while the total value of imports for consumption was \$2,423,977,000 in 1936 and \$3,012,487,000 in 1937. Crude materials exported in 1937 amounted to \$608,168,000 and in 1936 were \$721,871,000. Imports of crude materials amounted to \$732,965,000 in 1936 and \$973,535,000 in 1937. Crude foodstuffs exported in 1937 were valued at \$58,144,000 and \$101,742,000 in 1936. Imports of crude foodstuffs for consumption were \$348,682,000 in 1936 and \$413,345,000 in 1937. Manufactured foodstuffs exported in 1936 came to \$143,798,000 and in 1937 were \$177,451,000. Imports of manufactured foodstuffs for consumption amounted to \$386,240,000 in 1936, and \$440,103,000 in 1937. Semi-manufactures exported in 1936 were valued at \$394,760,000; in 1937 they were \$677,254,000. Imports of semi-manufactures for consumption totalled \$490,238,000 in 1936 and \$634,181,000 in 1937. Finished manufactures worth \$1,154,099,000 were exported in 1936 and \$1,616,598,000 worth in 1937. Of finished manufactures imported for consumption \$465,852,000, worth came during 1936 and \$551,323,000 were received in 1937'.

(b) Calculate the percentage increase of figures of 1937 over those of 1936 for each class of items. (15)

2. The following table gives the frequency distribution of grades obtained by students of a naval academy :

Grade Limits	No. of students	Grade limits	No. of students
68.0—69.9	4	80.0—81.9	35
70.0—71.9	17	82.0—83.9	22
72.0—73.9	39	84.0—85.9	18
74.0—75.9	62	86.0—87.9	13
76.0—77.9	58	88.0—89.9	4
78.0—79.9	52	90.0—91.9	2
		92.0—93.9	1

Calculate the first and the third quartiles and the first three moments about the mean. (25)

3. The following table gives the prices of building materials for the years 1926 to 1928. Calculate the index numbers of building material prices in 1927 and 1928 with 1926 as base.

Building materials	Unit	1926 quantity	prices in \$		
			1926	1927	1928
Brick	1000	74	13.0	14.0	13.7
Cement	bags	1495	1.7	1.7	1.7
Timber	1000 ft.	9	55.7	52.3	54.1
Paint	Galls.	397	2.2	2.2	2.2
Lavatories	each	18	12.4	11.2	11.2
Steel	100 lbs.	760	2.0	1.8	1.9
Gravel	ton	578	0.9	0.9	0.9

(10)

GROUP B

4. From the following pairs of values of x and y , fit by the method of least squares

$$y = a + bx + cx^2$$

Calculate the residual sum of squares.

Serial No.	x	y
1	58	77
2	65	91
3	66	84
4	70	91
5	73	95
6	73	112
7	67	95
8	82	143
9	92	120
10	98	132
11	99	142
12	102	151
13	105	175
14	104	157
15	95	144
16	40	42
17	38	31
18	88	140
19	44	54
20	52	93

(25)

5. The following table gives the yield of paddy (y) in lbs. per plot and the value of a concomitant character (x) for ten different manures each tried on two plots. Prepare a table of analysis of variance and covariance and test whether the manures

differ significantly amongst themselves in their effect on the yield after correcting for the effect of x .

Manures	y	z
A	9.50	11.25
	8.25	8.00
B	10.50	10.25
	7.75	8.75
C	10.25	8.25
	10.75	11.75
D	6.50	7.50
	8.50	9.25
E	11.75	11.50
	10.25	10.00
F	11.75	14.00
	9.50	10.00
G	10.50	11.50
	6.50	7.50
H	7.25	8.2
	7.00	8.0
I	11.00	11.75
	4.75	6.00
J	7.25	9.25
	9.00	9.00

(25)

6. The following correlation-table gives the scores of a number of students where X = scores in mathematics, Y = scores in intelligence.

Compute the correlation coefficient between X and Y .

$X \backslash Y$	145	135	125	115	105	95	85	75	65
2.5							1		
7.5				1	3	4		1	
12.5				2	1	2	3	2	
17.5			1	1	4	2	3	1	2
22.5		1	5	5	1	4	2	1	
27.5				1	4	2	1	1	
32.5	1	2	2	3	2	3			
37.5		2	3	2	4				
42.5			4	2		1			
47.5	1	1	1	1					
52.5	1	1	1						
57.5	1	1	1	1					

(25)

COMPUTER'S CERTIFICATE EXAMINATION, SEPTEMBER 1956

PART IB : SECTION II

Time : 3 Hours

Full Marks : 100

- (a) Answers to the different groups are to be given in separate books.
 (b) Attempt ANY TWO questions from Group A and ALL questions from Group B.
 (d) Use of Calculating machines is permitted.

GROUP A

1. The following data relate to the scores in English of 250 candidates appearing in a certain examination :—

Scores	Number of students
14.5—19.5	9
19.5—24.5	11
24.5—29.5	10
29.5—34.5	44
34.5—39.5	45
39.5—44.5	54
44.5—49.5	37
49.5—54.5	26
54.5—59.5	8
59.5—64.5	5
64.5—69.5	1

Fit a normal curve to the above distribution of scores. Draw the histogram and the fitted curve on a graph paper. Obtain the expected frequencies in the classes :

14.5—19.5, 24.5—29.5, 34.5—39.5, 44.5—49.5, 54.5—59.5 and 64.5—69.5.

2. (a) The following data relate to speech defects and physical defects of a number of school children :—

Physical defects	Speech defects		
	Serious	Intermediate	Mild
Serious	45	26	12
Intermediate	32	50	21
Mild	4	10	17

Use Chi-square test to examine whether there is any association between the two types of defects.

(b) The following results are available for the statures of a sample of men and women :—

	Sample size	mean	standard deviation
Men	1164	68.64	7.3861
Women	1458	63.87	6.7832

• Test whether the sex difference in stature is significant.

3. (a) Obtain the ordinates of the curve

$$y = 250 \left(1 + \frac{x}{13} \right)^3 e^{-x/5}$$

at $x = 0, 5, 10, 15$ and 20 .

(b) The following table gives the premiums for endowment assurances for different ages (in years) and terms of assurance (in years) :—

Age	Term of assurance		
	15	20	25
20	5.947	4.418	3.547
25	6.046	4.530	3.630
30	6.144	4.650	3.702

Obtain by linear interpolation the premiums for

- (i) age 23, term 17 years
- (ii) age 30, term 23 years
- (iii) age 23, term 20 years
- (iv) age 28, term 17 years

GROUP B

4. The following table gives the number of members of non-agricultural co-operative societies in Bombay State and the profits made by them between 1930 and 1949. Represent graphically the course of membership, aggregate profits and profits per member and comment on the graphs :

Non-agricultural Co-operative Societies in Bombay
State Membership and Profits

Year	Membership (in thousands of members)	Profits (in thousands of rupees)
1930	219	950
1931	233	968
1932	245	1054
1933	263	1102
1934	276	1222
1935	314	1540
1936	273	1217
1937	296	1283
1938	323	1297
1939	324	1382
1940	337	1349
1941	351	1333
1942	359	1575
1943	395	1844
1944	521	2236
1945	558	3127
1946	596	3667
1947	640	4810
1948	762	4316
1949	985	6457

5. Suppose you are required to compile the items of information listed below. State for each item (a) complete names of all the publications containing the information and in each case (b) the name of the publishing authority and (c) whether it is a weekly, fortnightly, monthly, quarterly or annual publication.

1. Passengers killed in railway accidents in a given year.
2. Wholesale price-index in Calcutta in a particular month.
3. Irrigated area under wheat in India in a particular year.
4. Area irrigated in India from different sources of irrigation in a particular year.
5. Total value of tea exported from India to UK in a particular year.
6. Number of educational institutions in India and scholars attending them in a particular year.
7. Working class cost of living index in Bombay in a particular month.
8. Man-days lost through industrial disputes in a particular year in India.
9. Number of factories in different States of India in a recent year.
10. Number and amount of foreign money order paid in India in a particular year.

COMPUTER'S CERTIFICATE EXAMINATION, SEPTEMBER 1956

PART IC : SECTION I

Time : 4 Hours

Full Marks : 100

- (a) Answers to the different groups are to be given in separate books.
 (b) Attempt ALL questions from Group A and ANY TWO questions from Group B.
 (c) Figures in the margin indicate full marks.
 (d) Use of Calculating machines is permitted.

GROUP A

1. (a) Find by graphical methods, to two places of decimal, the root of the equation :—

$$x^3 - 9x^2 + 23x - 14 = 0,$$

given that the root lies between 4 and 5. (15)

(b) Obtain graphically the root of the equation :—

$$x = 10 \log_{10} x \quad (10)$$

lying between 1 and 2, correct to two places of decimals.

2. The following data show the consumption of artificial silk in United States during the years 1910 to 1935 :—

Years	Consumption (Million pounds)	Years	Consumption (million pounds)
1910	9.2	1928	100.1
1920	8.7	1929	131.4
1921	10.8	1930	118.0
1922	24.7	1931	157.4
1923	32.6	1932	152.0
1924	42.2	1933	211.0
1925	58.3	1934	194.8
1926	60.6	1935	252.7
1927	100.0		

(a) Fit a cubic of the form $y = a + bx + cx^2 + dx^3$ to the data; where x represents year and y represents consumption.

(b) Represent the data graphically and draw the fitted curve over the graph of the observed data. (25)

GROUP B

3. The following table gives the values of 3 related variables Y , X_1 and $2X_2$ measured on 20 individuals:—

X_1	X_2	Y
162	3.1	45.5
163	1.8	45.7
166	1.2	46.7
166	8.4	43.0
166	0.6	46.8
164	2.4	47.6
155	1.9	43.9
159	3.2	44.8
154	0.7	43.6
157	2.6	44.3
158	3.2	44.3
167	4.8	45.2
163	3.0	45.5
160	3.8	44.0
167	1.8	47.6
156	0.6	44.2
153	1.3	43.9
168	5.4	45.5
164	2.4	45.0
168	2.4	11.7

(i) Find the regression equation of Y on X_1 and X_2 .

(ii) Find the partial correlation coefficient between Y and X_1 eliminating X_2 and test for its significance. (25)

4. In a study of the effect of the ages of seedling (two different ages) and dates of planting (four different dates) on the yield of two varieties of paddy, three plots were allotted to each of the $2 \times 4 \times 2$ combinations. The yields of grain in ounces from these plots are given below. Analyse the data and prepare the appropriate analysis of variance table.

Variety	Dates of planting	Ages of seedling					
		3 weeks			5 weeks		
A	14 July	43.0	50.5	58.5	46.0	57.0	46.0
	29 July	42.0	46.0	45.5	35.5	46.5	48.5
	13 August	43.0	41.0	41.0	37.5	42.0	39.5
	28 August	25.0	36.0	32.5	22.0	44.5	27.0
B	14 July	43.5	48.0	50.0	39.5	41.5	52.0
	29 July	34.5	46.0	55.0	36.5	47.0	51.0
	13 August	44.0	37.5	46.5	45.5	46.0	42.5
	28 August	33.5	40.0	39.5	23.5	30.0	44.5

(25)

5. (a) Find the values of $y = y_0 \left(1 + \frac{x-\mu}{a_1}\right)^{m_1} \left(1 - \frac{x-\mu}{a_2}\right)^{m_2}$

for the following values of x

$$x = 17, 22, 27, 32 \text{ and } 37.$$

given that $y_0 = 149.47$, $\mu = 26.76$, $a_1 = 1.0964$,

$$a_2 = 13.5273, \quad m_1 = 0.4098 \text{ and } m_2 = 2.7770.$$

(b) Expand and evaluate

$$(1+0.03)^6$$

(25)

COMPUTER'S CERTIFICATE EXAMINATION, SEPTEMBER 1950

PART IC : SECTION II

Time : 4 Hours

Full Marks : 100

- (a) Answers to the different groups are to be given in separate books.
 (b) Figures in the margin indicate full marks.
 (c) Use of Calculating machines is permitted.

GROUP A

1. From the following table of yearly premiums for policies maturing at quinquennial ages, estimate the premiums for policies maturing at all ages from 45 to 66 inclusive :

Ages :	45	50	55	60	65	
Premium :	2.871	2.404	2.083	1.862	1.712	(15)

Or,

A patient was treated for a period of 3 days and leucocyte counts were made on his blood immediately before treatment and after 1, 2, and 3 days. Four haemocytometer chambers I, II, III, IV were used and the counts were made by four girls A, B, C, D. The following table shows the arrangement of the experiment in the form of Latin square and the counts obtained :—

Time of count	Haemocytometer Chambers			
	I	II	III	IV
Before treatment	88A	103B	81C	92D
1 day after treatment	77D	87A	119B	95C
2 days after treatment	130B	114C	119D	106A
3 days after treatment	141C	115D	91A	101B

Perform an analysis of variance of the above data. (15)

2. (a) Calculate the first four moments about mean for the following frequency distribution. (15)

(b) Determine the type of the appropriate Pearsonian curve to be fitted to the data and evaluate the constants of the curve. Calculate the ordinate corresponding to the mean of the distribution. (20)

Bacilli per unit area	Frequency
0	219
1	287
2	219
3	120
4	70
5	50
6	26
7	13
8	5
9	2

GROUP B

3. In a randomised block experiment, there were six blocks. Each block was divided into five plots of 1/40th acre. Of these one plot did not receive any treatment and the rest were treated with manure M_1 , M_2 , M_3 or M_4 . The results of the experiment (yield of cereal crop) is given in the table below. Analyse the data and compare the effects of the different treatments :— (20)

Treatment	Blocks					
	I	II	III	IV	V	VI
none	187	243	198	310	267	243
M_1	242	321	261	317	255	381
M_2	212	202	265	255	238	309
M_3	260	318	260	340	362	400
M_4	203	275	207	331	229	268

4. With regard to the items of information listed below state (1) issuing authority, (2) name of the publication containing the information and (3) the place where the publication is available for (a) sale, (b) reference.

1. Yield of wheat per acre of India, the UK and the USA.
2. Total paddy acreage irrigated in Indian Union.
3. Number of factory workers in the Indian Union in 1954.
4. Number of accidents in coal-mines in 1954 in the Indian Union.
5. Number of motor vehicles registered in 1953 in the Indian Union.
6. Total electric energy generated in your State during 1954.
7. Value of imports to India of machinery in the year 1952.
8. Number of passengers carried by air and by railways during 1953-54 within India.
9. Total revenue from excise duty and from incometax of Government of India in 1952-53.
10. Density of population in Asian Countries. (15)

5. Find the value of the following determinant and also of the cofactors of each of the diagonal elements :—

$$\begin{vmatrix} 1.234 & 0.005078 & -235.6 \\ 67.82 & -2341.0 & 1.234 \\ 0.9876 & 87.65 & -50.78 \end{vmatrix} \quad (15)$$