This question paper contains 7 printed pages.]

Your Roll No. .....

2555 **A**

M.Sc./Sem. II

Paper—205 : Geostatistics

(Admission of 2010 and onwards)

Time : 3 *Hours* *Maximum Marks* : 70

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt any ***five*** *questions.*

Use of scientific calculator is permitted.

1. (a) The daily expenditure of 100 families is given as under : 7

Expenditure :	0–10	10–20	20–30	30–40	40–50
No. of families :	14	?	27	?	15

Find out the missing frequencies.

(b) Goals scored by two teams A and B in a football season were as follows : 7

[P.T.O.

No. of goals scored in a match	*No. of matches*	
	A	*B*
0	27	17
1	9	9
2	8	6
3	5	5
4	4	3

Find out which team is more consistent.

2. (a) Fit a parabola of second degree to the data :

x :	1.0	1.5	2.0	2.5	3.0	3.5	4.0
y :	1.1	1.3	1.6	2.0	2.7	3.4	4.1

7

(b) A computer while calculating r_{xy} from 25 pairs of observations obtained the following constants :

$n = 25, \Sigma x = 125, \Sigma x^2 = 650, \Sigma y = 100, \Sigma y^2 = 460, \Sigma xy = 508$

A recheck showed that he had copied down two pairs (6, 14), (8, 6) while the correct values were (8,12) and (6, 8) respectively. Obtain the correct value of the correlation coefficient. 7

3. (a) One hundred and fifty hand specimens of rock are classified according to the region from which they are taken and to whether their copper content was low, medium or high. The number of specimens in each category were as shown in the table : 7

Copper	*Region*		
	A	*B*	*C*
Low (L)	30	19	8
Medium (M)	10	20	17
High (H)	15	18	13

If a specimen is chosen at random :

(i) What is the probability that it contains a high level of copper ?

(ii) What is the probability that it contains a high level of copper if it is known that it came from region A ?

(b) A region is divided into blocks named high, medium and low (according to the proportion exploitable for Iron ore) which account for 30, 10 and 60 percent respectively of the total area. The proportions of these blocks which may be exploited for Iron ore are 60, 40 and 10 respectively. What proportion of the region is exploitable ? 7

4. (a) In a certain factory turning out hand pumps, there is a small chance $\frac{1}{500}$ for any hand pump to be defective. 10 pumps are supplied to each of 10,000 villages in a country. Find out the approximate number of villages containing more than 2 defective pumps. 7

(b) A mineral deposit consists of many copper bearing veins distributed in a barren host rock. A large number of boreholes were drilled into the deposit during a development programme. The percentage of holes that intersected one or more veins amounts to 90 percent. Later 8 new holes were drilled near the margin of the deposit. Find the probability that atleast 5 new holes will intersect the veins. 7

5. (a) A bombing plane carrying three bombs flies directly above a railway track. If a bomb falls within 40 feet of track the track will be sufficiently damaged to disrupt the traffic.

With a certain bomb-sight, the points of impact of a bomb have the probability density function :

$$f(x)=\begin{cases}\dfrac{100+x}{10^4} & \text{when } -100\le x\le 0\\[2ex] \dfrac{100-x}{10^4} & \text{when } 0\le x\le 100\\[2ex] 0 & \text{elsewhere}\end{cases}$$

where x represents the deviation (in feet) from the aiming point which is the track in this case. If all the three bombs are used, what is the probability that the track will be damaged ? 7

(b) The local authorities in a certain city installed 2000 electric lamps in a street of the city. If the lamps have an average life of 1000 burning hours with a S. D. of 200 hours. (i) What number of lamps might be expected to fail in the first 700 burning hours, (ii) after what periods of burning hours would we expect that : (a) 10 percent of the lamps would have failed, (b) 10% of the lamps would be still burning?

Assume that the lives of the lamps are normally distributed. Given that $F(1.50)=0.933$, $F(1.28)=0.900$ $F(t)=\int_{-\infty}^{t} \frac{1}{\sqrt{2\pi}} e^{-z^2/2}\, dz$

7

6. (a) The mean yield of two sets of plots and their variability are as given below. Examine (i) whether the difference in the mean yields of the two sets of plots is significant and (ii) whether the difference in the variability in yields is significant.

	Set of 40 plots	***Set of 60 plots***
Mean yield per plot	1258 lb	1243 lb
S. D. per plot	34	28

7

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(b) Two sample balls of votes for two candidates A and B for a public office are taken one from among residents of rural and urban areas. The results are given below. Examine whether the nature of the area is related to voting preference in this election. (Use χ^2 test and $\chi^2_{0.005}$ with 1 degree of freedom = 3.84) 7

Votes for / *Area*	*A*	*B*	*Total*
Rural	620	380	1000
Urban	550	450	1000
Total	1170	830	2000

7. (a) The first four moments of a distribution about the value 4 are $-1.5, 17, -30, -108$. Find the moments about the mean, β_1 and β_2. 7

(b) In a geological formation there are 50 percent ferruginous (red) beds and 50 percent are "not red" beds. If samples are collected randomly, out of 10 samples, how many are red ? 7

8. (a) A certain stimulus used in each of 9 rice fields in a city resulted in the following increase of productivity (in thousand tonnes) :

$7, 3, -1, 4, -3, 5, 6, -4, 1.$

Can it be concluded that the stimulus will, in general, be accompanied by an increase of productivity of rice ? 7

[Given that $t_{0.05}(8) = 2.31$]

(b) A random sample of 1000 farms in a certain year gives an average yield of rice 2000 lbs per acre with a s. d. of 192 lbs. A random sample of 1000 farms in the following year gives an average yield of 2100 lbs per acre with a s. d. of 224 lbs. Show that the data are inconsistent with the hypothesis that the average in the country as a whole was the same in the two years. 7