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Sr. No. of Question Paper : 1710 C Roll No.....

Unique Paper Code : 219261

Name of the Course : B.Sc. (Hons.) Geology

Name of the Paper : GEHT-404 : Probability and Statistics

Semester : IV

Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **two** questions from each Section.
3. **All** Sections carry equal marks.
4. Use of standard normal distribution table is allowed.

SECTION I

1. (a) The following table shows the daily expenditure on food of 25 households in a locality.

Daily expenditure (in Rs.)	100-150	150-200	200-250	250-300	300-350
Number of households	4	x	12	y	2

Calculate the missing frequencies if their arithmetic mean = 211 Rs. (6½)

- (b) Calculate the mean deviation from the median of the following distribution

C.I.	0-10	10-20	20-30	30-40	40-50
Frequency	5	8	15	16	6

. (6)

P.T.O.

2. (a) Use the method of least squares to determine a and b in $y = ax + bx^2$ for the following observations and estimate the value of y when $x = 2$.

x	1	2	3	4	5
y	1.8	5.1	8.9	14.1	19.8

(6½)

- (b) Calculate the coefficient of correlation between x and y from the following table

x	1	2	3	4	5	6	7	8	9
y	9	8	10	12	11	13	14	16	15

(6)

3. (a) The first four moments of a distribution about the value 5 of the variable are 2, 20, 40 and 50. Show that the mean is 7, variance is 16, $\mu_3 = -64$, $\mu_4 = 162$, $\beta_1 = 1$ and $\beta_2 = 0.63$. (6½)

- (b) For two variables x and y , the two regression lines are $x + 2y - 5 = 0$ and $2x + 3y - 8 = 0$. If $\text{var}(x) = 12$, find \bar{x} , \bar{y} , σ_y and r . (6)

4. (a) A box contains 2^n tickets among which ${}^n C_i$ tickets bear the number i ; $i = 0, 1, 2, \dots, n$. A group of m tickets is drawn. What is the expectation of the sum of their numbers? (6½)

- (b) What is the probability that four 'S' come consecutively in the word MISSISSIPPI? (6)

SECTION II

5. (a) Define Binomial distribution and find its moment generating function, mean and variance. (6½)

- (b) If a random variable X has poisson distribution with mean 1, then show that

$$E\{|X - 1|\} = \frac{2}{e}. \quad (6)$$

6. (a) Define cumulative distribution function of a random variable X. Further, state and prove its properties. (6½)
- (b) Show that for the normal distribution, all odd order moments about the mean vanish and the even order moments about the mean are equal to $\mu_{2n} = 1.3.5 \dots (2n-1)\sigma^{2n}$. (6)
7. (a) State central limit theorem for independent and identically distributed random variables and use it to find the approximate probability that the sum obtained is between 30 and 40, when 10 fair dice are rolled. (6½)
- (b) Two cards are drawn from a well-shuffled pack of 52 cards without replacement. Find the probability distribution of number of kings. (6)
8. (a) The probability of a soldier hitting a target is 1/8. If he fires 5 times, then what is the probability that he hits the target at least twice? (6½)
- (b) Let X be normally distributed with mean $\mu = 8$ and standard deviation $\sigma = 4$. Find
- (i) $P(5 \leq X \leq 10)$ (ii) $P(X \geq 15)$ (6)

SECTION III

9. (a) A drug was administered to 10 patients and the increments in their blood pressure (B.P.) were recorded to be

6, 3, -2, 4, -3, 4, 6, 0, 0, 2

Is it reasonable to believe that the drug has no effect on change of B.P. ?
(Given that $t_{0.05}$ for 9 d.f. 2.26). (6½)

- (b) The nine items of a sample had the following values :

45, 47, 50, 52, 48, 47, 49, 53, 51.

Does the mean of the nine items differ significantly from the assumed population mean of 47.5 ? (6)

10. (a) Five coins are tossed 3200 times and the following results are obtained :

No. of heads	0	1	2	3	4	5
Frequency	80	570	1100	900	500	50

If $\chi_{0.05}^2 = 11.070$ for 5 d.f., test the hypothesis that the coins are unbiased. (6½)

- (b) Write a note on any **two** of the following :

(i) Correlation coefficient

(ii) Stochastic process

(iii) Markovian Chains

(6)

11. (a) A sample of 400 male students is found to have a mean height of 67.47 inches. Can it be reasonably regarded as a sample from a large population with mean height 67.39 inches and standard deviation 1.30 inches? (6½)

- (b) A sample of 50 associate degree graduates (sample A) and a sample of 60 baccalaureate graduates (sample B) yielded the following means and standard deviations :

Sample	\bar{x}	σ
A	52.5	10.5
B	49.6	11.2

On the basis of these data, what should the researcher conclude ($\alpha=0.05$). (6)

12. (a) A sample of 900 days is taken from meteorological records of a certain district and 100 of them are found to be foggy. What are the probable limits of foggy days in district? (6½)

- (b) In two large populations, there are 30 and 25 percent respectively of fair haired people. Is this difference likely to be hidden in samples of 1200 and 900 respectively from the two populations at 5% level of significance? (6)