MMDSE-3.6

Sl.No. :

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III Semester M.Sc. Degree Examination, June/July - 2024
(CBCS, SLM Scheme)
MATHEMATICS
Course - VI : Mathematical Statistics

Time : 3 Hours **Max. Marks : 80**

Instruction : ***Answer any five full questions :***

Q1) a) Distinguish between schedule and questionnaire. Describe briefly the characteristics of a good questionnaire.

b) Explain the method of constructing histogram and frequency polygon.

c) Form a frequency distribution for the following data representing marks in mathematics of 30 students : 50, 92, 63, 88, 65, 62, 61, 63, 68, 66, 63, 95, 64, 67, 68, 96, 86, 64, 63, 77, 68, 60, 73, 63, 64, 66, 67, 72, 61, 90.

[5+4+7]

Q2) a) State and prove properties of arthematic mean.

b) Explain skewness and Kurtosis.

c) Find the standard deviation for the following data :

x :	10	22	26	35	36	40
f :	3	12	20	7	8	5

[6+4+6]

Q3) a) Prove that multiplication property of probability.

b) A dice is thrown once what is the probability that

i) an even number or a prime number

ii) an odd number or a multiple of 3.

c) Let X be the continuous random variable with probability density function

$f(x)$ is given by $f(x) = \begin{cases} kx, & 0 \le x \le 1 \\ k & 1 \le x \le 2 \\ -kx + 3k, & 2 \le x \le 3 \\ 0, & \text{otherwise} \end{cases}$

Find the value of K and P ($X \le 1.25$).

[5+5+6]

Q4) a) The joint probability density function of a bivariate random variable (x, y) is $f(x, y) = 4xy$, $0 < x < 1$, $0 < y < 1$, find $\mathrm{E}\left(x \mid y = \frac{1}{2}\right)$.

b) State and prove De-Moivre's Laplace theorem for central limit theorem for iid random variables.

c) Let X_i, $i = 1, 2, \ldots\ldots, n$ be i.i.d. Poisson random variable with parameter λ. Show that the sum $S_n = \sum_{i=1}^{n} X_i$ is distributed as asymptotic normal.

[5+6+5]

Q5) a) Define binomial distribution. Obtain its mean and variance.

b) Monthly income of employees follows normal distribution with mean Rs. 20,000 and standard deviation Rs. 600. Find the percentage of employees with monthly income

i) Less than Rs. 22,000.

ii) Lies between Rs. 16,000 and 21,000.

c) State properties of normal distribution.

[7+4+5]

Q6) a) Write a note on chisquared distribution.

b) If $X \sim N(\mu, \sigma^2)$, then find MLE of μ and σ^2.

c) If a random sampling from normal distribution with mean μ and variance σ^2. Find the MME and MLE for μ and σ^2 from the following data : 3, 8, 16, 12, 10, 4, 5, 1.

[4+4+8]

Q7) a) Explain one tailed and two tailed test.

b) A random sample of 400 tins of ghee has mean weight 5.96 kgs and the standard deviation of 0.5kg. Test at 5% level of significance that the average weight of tins of ghee is less than 6kg.

c) In a city, out of 500 students who took MCA examination, 460 are passed and out of 400 student's who took MBA examination 350 are passed. At 1% level of significance, can we conclude that MCA students have performed better than MBA students.

[5+5+6]

Q8) a) Write a procedure for testing the significance of single mean and to test the significance of difference of means for small sample test.

b) Calculate the rank correlation co-efficient for the data given below and test whether correlation co-efficient differ significantly or not at 1% level of significance?

X :	18	28	35	44	35	26	37	48
Y :	83	51	34	34	34	28	46	47

[7+9]

