NB :

    1) All the questions are compulsory.

    2) Figures to the right indicate marks.

    3) Graph papers and statistical tables will be provided on request.

Q. 1. a) For a continuous random variable X Define Cumulative probability distribution function and State its properties. Also define median.   **[6]**

    b) The probability density function of continuous random variable X is given by

$$f(\chi) = K\chi^2 (1 - \chi) \quad ; 0 < \chi < 1$$
$$= 0 \text{ otherwise}$$

Find K and mean of X.   **[6]**

<div align="center">OR</div>

Q. 1. p) Define :- Continuous random variable.

                Probability density function of a continuous random variable.

                State the properties of probability density function.   **[6]**

    q) Find p.d.f. of X, where cumulative distribution function F(x) is given by

$$= 0 \quad ; \chi < 0$$
$$F(\chi) = \chi^3 \; ; \; 0 \leq \chi \leq 1$$
$$= 1 \quad \chi > 1.$$

Hence find mean and variance.   **[6]**

Q. 2. a) If X follows Rectangular distribution in (a, b), write down the probability density function of X. Hence obtain the expression for its mean and variance of X.   **[6]**

    b) The distribution of monthly incomes of a group of 3000 university teachers conforms to a normal curve with the mean equal to Rs. 6000 and the standard deviation equal to Rs. 1000.

    Find (i) the percentage of teachers having a monthly income of more than Rs. 8000.

        (ii) The number of teachers having a monthly income of less than Rs. 4000.   **[6]**

<div align="center">OR</div>

    p) State the probability density function of a normal distribution. Define standard normal variate. What are the characteristics of a normal curve.   **[6]**

    q) The time (in minutes) between telephone calls at an Insurance claims office has the following exponential distribution.

$$f(x) = \frac{1}{3} e^{-\chi/3} \quad ; 0 \leq \chi \leq \infty$$
$$= 0 \quad \text{otherwise.}$$

i) What is the mean time interval between consecutive telephone calls ?

ii) What is the probability of having 6 or more minutes without a telephone call?

iii) What is the probability of receiving a telephone call between 6 and 9 minutes just after the receipt of a call. [6]

Q. 3. a) Explain the following terms :-

i) Simple hypothesis and composite hypothesis

ii) Critical region.

iii) Type I Error and Type II Error. [6]

b) In Ghat areas in a country on an average four road signsare found per km. with a standard deviation of 1 per km. A Ghat area selected at random is very wide with an across road measuring 100 km. Find the chance that the mean number of road signs per km (i) lies between 3.8 and 4.1 [6]

(ii) exceeds 4.2

(iii) does not exceed 4.25

OR

[6]

p) Explain the following terms :-

i) Statistic

ii) Parameter

iii) Estimator

iv) Estimate

v) Confidence interval

vi) Standard Error

q) A random sample of 100 balls selected from a large consignment of tennis balls gave 10% bad balls. Find 99% confidence limits for the percentage of bad balls in the consignment. Also find 95% confidence limits. [6]

Q. 4. a) The demand of cakes (in kgs) at a bakery shows Rectangular distribution in (1000, 1500). Find the probability that on a certain day the demand would be (i) atleast 1300 kg.

(ii) between 1100 kg and 1450 kg.

and (iii) at most 1400 kg. [7]

b) A Shoe manufacturing company claims that one of their popular brand of shoes lasts for 74 weeks on an average with a standard deviation of 25 weeks. A sample of 50 pairs of shoes of the same brand used by people from different classes and from different professions showed a mean life of 70 weeks. Test the claim at 5% level of significance. [7]

OR

p) Two billing clerks kunj and Keyur working in a store are believed to be equally efficient as regards their speed in preparing the bills. Independent samples of 14 and 20 days show that average number of bills prepared by them are 480 and 510 per day with standard deviations of 12 and 18 per day respectively. Check whether this indicates a change in their efficiency at 1% level of significance.   [7]

q) Find the cumulative distribution function F (χ) for the random variable X with p.d.f. as

$f(\chi) = \chi$; $0 < \chi < 1$
$= 2 - \chi$; $1 \le \chi < 2$
$= 0$ otherwise.

Also find its mean and variance.   [7]

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