

Time: 1:30Hr

Marks:40 7-30-00

Note:

1. All questions are compulsory.
2. Attempt any two sub questions from each question
3. Figure to right indicates marks.
4. Use of calculator is allowed.

Q1. Attempt any 2 from the following.

1. In a continuous distribution, the density function is (5)

$$f(x) = \begin{cases} kx(2-x) & 0 \leq x \leq 2 \\ 0 & \text{otherwise} \end{cases}$$

Find k, mean and variance of the distribution

2. Determine cumulative distribution function F(x) for the following probability density function. (5)

$$f(x) = \begin{cases} kx & 0 \leq x \leq \frac{1}{2} \\ 6(1-x) & \frac{1}{2} \leq x \leq 1 \\ 0 & \text{otherwise} \end{cases}$$

Where k is constant to be suitably chosen.

3. X is a continuous random variable with p.d.f. (5)

$$f(x) = \begin{cases} \frac{k}{x^2} & x \geq 100 \\ 0 & x < 100 \end{cases}$$

Find k and the prob.(x < 150)

Q2. Attempt any 2 from the following.

1. The Distribution of number of words written per day by a certain writer over a period of one year showed Rectangular distribution over (1000, 2000). Find the chance that on a randomly chosen day of the year he wrote (i) at least 1200 words (ii) anywhere from 1250 to 1750 words. (5)

2. A study of divorced men showed that the interval of time (in years, x) between the day of their marriage and the day of their divorce has the following p.d.f. (5)

$$f(x) = \begin{cases} 0.2e^{-0.2x} & x > 0 \\ 0 & \text{otherwise} \end{cases}$$

Find the probability that one Mr. X who got divorced during the year spent (i) at most one year (ii) at least 5 years of marital life before the divorce.

3. If the marks in a particular subject are assumed to follow normal distribution with mean 40 and variance 9, find how many out of 1000 students get marks (5)
(i) below 35
(ii) between 43 and 46.

Q3. Attempt any 2 from the following.

1. The mean life of a large lot of fluorescent tubes is 1570 hrs. with a standard deviation of 150 hrs. A sample of 100 tubes is drawn from it with replacement. Find the probability that mean life of these tubes will (5)
(i) exceed 1600 hrs. (ii) not exceed 1540 hrs.
(iii) lie between 1550 hrs. and 1600 hrs.
2. If p denotes the probability of a fuse working properly, the following procedure is adopted to test the hypothesis $H_0 : p = 0.9$ against the alternative $H_1 : p = 0.8$. Inspect four and retain H_0 if all are working properly. Calculate the probabilities of Type I and Type II errors. At what level of significance is the test based? (5)
3. A pharmaceutical firm maintains that the mean time for a drug to show effect is 24 minutes. In a sample of 400 trials, the mean time is 26 minutes with a standard deviation of 4 minutes. Test the hypothesis that the mean time is 24 minutes against the alternative that it is not equal to 24 minutes. Use 5% level of significance. (5)

Q4. Attempt any 2 from the following.

1. A random variable X is normally distributed with mean = 12 and s.d. = 2. Find Prob. $(9.6 < X < 13.8)$. (5)
2. Let x be a statistic having a Poisson distribution with parameter m . If the hypothesis $H_0 : m = 3$ is rejected in favour of $H_1 : m = 4$ when $x > 4$, obtain the expressions for probabilities of type I and Type II error. (5)
3. A group of 121 boys obtained mean intelligence quotient (I.Q.) of 84 while a group of 81 girls obtained 80. If the s.d. of I.Q. is given to be 10, can we conclude that there is a significant difference between their performances? Use 5% level of significance. (5)