

N.B. :

- 1) All questions are compulsory.
- 2) All questions carry equal marks.
- 3) Figures to the right indicate full marks assigned to each sub-question.

Q.1. a) Define 'continuous random variable'. (1)

OR

a) Fill in the blanks : (1)
If Z is the mode of the probability distribution of a continuous random variable then $f(x)$ is _____ at $x = z$.

Q. 1. b) Attempt any two subquestions out of three from the following -

i) Define for a continuous random variable its
(p) probability density function.
(q) cumulative distribution function.
state two properties of each of them. (7)

ii) For a continuous random variable its probability distribution functions $f(x)$ is given as.

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

Find k Hence find mean. (7).

iii) The amount of bread x (in hundreds of pounds) that a certain bakery is able to sell in a day is found to have a p.d.f

$$f(x) = \begin{cases} x/25 & ; & 0 < x \leq 5 \\ = \frac{1}{25} (10-x) & ; & 5 < x \leq 10 \\ = 0 & \text{otherwise} \end{cases}$$

What is the probability that the number of pounds of bread sold in a day will be

- 1) More than 500 pounds
- 2) less than 500 pounds
- 3) between 250 and 750 pounds. (7)

Q.2. a) If x has exponential distribution with parameter $\lambda = \frac{1}{2}$ then what is the value of mean (1)

OR

Q.2. a) For a normal distribution with mean 100 and variance 50 what is the total area under the normal curve. (1)

Q. 2. Attempt any two sub questions out of three from the following.

- i) If x follows Rectangular distribution in (a,b) . Write down the probability density function of x . Hence obtain its mean and variance of x . (7)
- ii) The mileage (in thousand of miles) which car owners get with a certain kind of tyres is a random variable having probability density function

$$f(x) = \frac{1}{20} e^{-x/20} \quad ; \quad \text{for } x > 0 \quad (7)$$
$$= 0 \quad ; \quad x \leq 0$$

Find the probability that one of these tyres will last for

- p) atmost 12,000 miles.
- q) anywhere from 16,000 to 24,000 miles. (7)
- iii) The income distribution of a group of 1000 persons was found to be normal with mean Rs. 750 per day and standard deviation Rs. 50/- per day. What percentage of this group had income :-
- (p) exceeding Rs. 668
- (q) exceeding Rs. 832 (7)

Q. 3. a) Define parameter. (1)

OR

Q. 3. a) Select the appropriate alternative out of given ones & fill in the blank.

The hypothesis under test is _____

- (i) simple hypothesis (ii) alternative hypothesis (1)
- (iii) null hypothesis (iv) none of the above

Q. 3. b) Attempt any two sub questions our of three from the following.

- i) Explain the terms with one illustration.
- (i) Estimator and estimate
- (ii) Critical region.
- (iii) Level of significance
- (iv) Type I error and Type II Error. (7)
- ii) Twenty samples of size 100 each are selected from a very large consignment of blades. Find the expected number of samples that will have atleast 14 defective blades if the consignment has 10% defective blades. (7)
- iii) 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 the average no. 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. 4. a) For a normal distribution what is the relation between mean, median and mode ? (1)

OR

- Q. 4. a) Select the correct alternative out of given ones and fill in the blank :
For a continuous random variable

$$P[x \geq a] \quad \underline{\hspace{2cm}} \quad P(x > a]$$

(i) not equal to

(ii) greater than

(iii) less than

(iv) is equal to

(1)

- Q. 4. b) Attempt any two sub questions out of three from the following :-

- (i) The distribution function of a random variable x is given by

$$\begin{aligned} F(x) &= 0 && x < 0 \\ &= \frac{x}{8} && ; \quad 0 \leq x < 2 \\ &= \frac{x^2}{16} && ; \quad 2 \leq x < 4 \\ &= 1 && ; \quad x \geq 4 \end{aligned}$$

Find probability density function of x . Hence find $P[1 < x < 3]$ (7)

- (ii) 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.

(p) atleast 1200 words.

(q) anywhere from 1250 to 1750 words.

(r) anywhere from 1100 to 1800 words. (7)

- (iii) An advertising firm claims that 20% of all T.V. viewers watch a specific T.V. programme. In a random sample of 1000 viewers only 184 were found to be watching this T.V. programme. Test at 5 percent level whether this is sufficient evidence to dismiss the advertiser's claim. (7)

