MN3AAE

TIME: 2Hrs.   MARKS: 60

N.B.:1. All questions are compulsory.

2. Figures to the right indicate marks.

Q.1 a.   Define probability density function of a continuous random variable X.   (1)

   OR

   a.   State whether the statement is True or False.   (1)

   For a continuous random variable ~~f(x)=12 for suitable range (to be~~
   determined) is impossible because f(x) cannot be greater than 1.

   b.   Attempt Any Two questions out of Three from the following.

   1.   Define the following terms: (7)
        i) Expectation of a continuous random variable.
        ii) Raw moments.
        iii) Central moments.
        iv) Skewness.
        v) Kurtosis.

   2.   For a continuous random variable X, its p.d.f. is given by   (7)

        $f(x) = k(x-1)^2$ $1 < x < 3$

        $= 0$ otherwise

        Find k and mean of X.

   3.   Suppose the number of minutes a typist spends during an eight hour day for   (7)
        non- productive activities has the p.d.f.
        $f(x) = k/x^3$ $x \geq 30$
        $= 0$ otherwise
        Find k. Obtain the cumulative distribution function of the distribution.
        Determine the probability that she wastes at least 40 minutes of her working
        period.

Q.2. a.   If X follows exponential distribution with parameter λ, then its mean=____ and (1)
        variance = ____.

   OR

   a.   State the p.d. f. of a Normal distribution.   (1)

b. Attempt Any Two questions out of Three from the following.

1. If X follows Rectangular distribution in (a,b), wrte down p.d.f. of X. Hence obtain its mean and variance. (7)

2. The mileage (in thousands of miles) which car owners get with a certain kind of tyres is a random variable having p.d.f. (7)

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

Find the probability that one of these tyres will last for –

i) at most 10000 miles

ii) anywhere from 16000 to 24000 miles.

3. A certain project is estimated by a contractor to cost Rs.10000. He decides to bid for the contractof this project at the rate of Rs.15000. He finds from his past experience that in such cases the lowest bid (in Rs.) for the contract (excluding his) follows rectangular distribution in (7500,20000). Find the chance that the contractor would win the bid. (7)

Q.3. a. What is parameter?

OR
(1)

a. A statistical hypothesis is an assumption regarding_____.
(1)

b. Attempt Any Two questions out of Three from the following.

1. Explain how would you arrive at the best decision criterion based on a large sample to test the hypothesis $H_0 : \mu = \mu_0$ against $H_1: \mu > \mu_0$, where μ_0 is a specified constant and μ is the mean of a population under consideration, if you use 5% level of significance. (7)

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 4 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? (7)

3. Random sample of 400 men and 500 women were asked whether they would (7) like to have a flyover near their residence. 200 men and 325 women were in favour of the proposal. Test the hypothesis that the proportion of men and women in favour of the proposal are same against that they are not at 5% level of significance.

Q.4. a. For a normal distribution with mean 80 and variance 36, what is the total area (1) under the normal curve.

OR

a. State any one important property of a Chi-square variate . (1)

b. Attempt Any Two questions out of Three from the following.

1. Find the cumulative distribution function F(x) for the random variable X with (7) p.d.f. as-

$$f(x) = x \qquad\qquad 0< x < 1$$
$$= 2 - x \qquad\qquad 1\leq x < 2$$
$$= 0 \qquad\qquad\qquad otherwise$$

Draw a sketch of f(x) and F(x).

2. Number of patients visiting a doctor's clinic follows Normal distribution with (7) mean 50 and standard deviation 10. How many days of a month (26 working days) does doctor expect

(i) atleast 60 patients

(ii) 35 to 55 patients?

3. For a given sample of 200 items drawn from a large population, the mean is (7) 65 and the standard deviation is 8. Find 95% confidence limits for the population mean.

****