

Duration: 2 hrs.

Marks: 60

Note: 1) All questions are compulsory and carry equal marks.

2) Figures to right indicate marks.

3) Use of Scientific calculator is allowed.

Q.1 a) Define the Beta distribution of second kind. Obtain its mean, variance and harmonic mean. (08)

OR

Q.1 a) a) If X and Y are two independent random variables following exponential distribution with mean 1, then $\frac{X}{X+Y}$ follows uniform (0,1). (08)

b) If r.v X follows exponential distribution with mean 2, obtain F(x) at x=4. Also obtain median of the distribution.

Q.1 b) If r.v X ~ Gamma (a, λ). Calculate Karl Pearson's coefficient of skewness. And comment on the nature of the curve. (08)

OR

Q.1 b) a) If $X \sim U(0,1)$, Find the probability distribution of $\frac{X}{1+X}$ (08)

b) If $X \sim U(5,b)$ and $P(6 < X < 9) = \frac{3}{5}$, find b.

Q.2 c) Obtain Median and Mode of Normal Distribution having μ and σ^2 as a parameter. State any four properties of normal distribution. (08)

OR

Q.2 c) a) Derive probability density function of log - normal distribution. Hence find its mean. (08)

b) Derive the multiplicative property of log normal distribution.

Q.2 d) a) If X_1, X_2, \dots, X_k are k independent normal variables such that $X_i \sim N(\mu_i, \sigma_i^2)$ and a_1, a_2, \dots, a_k are k constants. Show that $\sum_{i=1}^k a_i X_i \sim N(\sum_{i=1}^k a_i \mu_i, \sum_{i=1}^k a_i^2 \sigma_i^2)$. (08)

b) If a random variable $X \sim N(\mu, \sigma^2)$, obtain the probability distribution of (i) ax (ii) x + a.

OR

Q.2 d) A r.v X follows Normal Distribution with parameters μ and σ^2 . Derive its moment generating function and hence explain the nature of the curve. (08)

Q.3 e) a) Show that sum of squares of n independent $N(0,1)$ r.v is Chi square variate with n d.f. (08)

b) Explain the procedure for testing the independence of attributes in a 2 x 2 contingency table. Also explain when and how Yate's correction is applied.

OR

Q.3 e) a) Derive probability density function of t distribution and hence obtain its mean. (08)

b) Explain paired t test for testing two population means, stating underlying assumptions.

Q.3 f) a) State the properties of t - distribution. (08)

b) If t follows t distribution with n d.f. then show that t^2 follows F distribution with (1, n) d.f

OR

Q.3 f) a) Derive $100(1-\alpha)$ % Confidence Interval for the difference between means of two independent Normal populations having the same variance. (08)

b) Derive the distribution of reciprocal of F variate.

Q.4 1. State True or False and correct if necessary: (12)

a) If $X \sim U(3, 5)$ then mean is 4.

b) Area under the Normal curve between first and third quartile is 25%.

c) Moment Generating Function of Cauchy distribution does not exist.

2. Answer the following:

a) What is the mean of a triangular distribution on (a, c) with peak at b?

b) State the properties of cumulative distribution.

c) State the additive property of Chi square Distribution.