

This question paper contains 4 printed pages.

5184-B

Your Roll No.

Concurrent Courses for B.Sc. Prog. B

MATHEMATICAL SCIENCES

Paper STC-301 : Basic Statistics and Probability

Time : 3 hours

Maximum Marks : 75

*(Write your Roll No. on the top immediately
on receipt of this question paper.)*

Attempt any six questions.

1. (a) Define A.M., G.M. and H.M. of grouped and ungrouped data. Also discuss their merits and demerits.
- (b) Obtain the relation between the central moments and the raw moments of order r . 6/2,6
2. (a) An urn contains 6 white, 4 red and 9 black balls. If 3 balls are drawn at random, find the probability that:
 - (i) Two of the balls drawn are white
 - (ii) One is of each colour
 - (iii) None is red.
- (b) If BCA , then prove that:

$$P(A \cap \bar{B}) = P(A) - P(B)$$

P. T. O.

$$P(B) \leq P(A).$$

61/2, 6

3. (a) Give the classical definition of Probability. What are the objections raised in this definition?

- (b) A continuous random variable X has a p.d.f.

$$f(x) = 3x^2, \quad 0 \leq x \leq 1.$$

Find a and b such that:

(i) $P(X \leq a) = P(X > a)$

(ii) $P(X > b) = .05.$

6,61/2

4. (a) Define mathematical expectation of a random variable X .

If X and Y are random variables, then show that:

$$E(X+Y) = E(X) + E(Y).$$

- (b) Define characteristic function of a random variable X .

Obtain the characteristic function of a random variable X having the p.d.f.:

$$f(x) = \frac{1}{3}, \quad -1 < x < 2.$$

6,61/2

5. (a) Obtain the m.g.f. of the binomial distribution. Show that the sum of two independent binomial variates is a binomial variate if they have the same probability of success.

- (b) Let X be a discrete r.v. having geometric distribution with parameter p . Obtain its mean and variance. Also show that for any two positive integers s and t :

$$P(X > s+t | X > s) = P(X > t). \quad 6, 6\frac{1}{2}$$

6. (a) Obtain mean and mode for a normal distribution $N(\mu, \sigma^2)$.

- (b) Show that the gamma distribution with parameter λ tends to normal distribution for large values of λ .

6 $\frac{1}{2}$, 6

7. (a) A random variable X has a uniform distribution over $(-3, 3)$. Compute:

(i) $P(X=2)$ and $P(X < 2)$.

(ii) Find k for which $P(X > k) = \frac{1}{3}$.

- (b) Find the mean deviation from the mean and standard deviation of A.P. $a, a+d, a+2d, \dots, a+2nd$.

5 $\frac{1}{2}$, 7

8. (a) Let X be a random variable with the following probability distribution:

x :	-3	6	9
$P(X=x)$:	1/6	1/2	1/3

Find $E(X)$, $E(X^2)$ and $V(X)$.

- (b) Find the m.g.f. of Poisson distribution with parameter λ .
- (c) Show that the sum of deviations about mean is zero. 5/2, 5, 2

9. Write short notes on any *three* of the following:

- (a) Histogram and frequency polygon
- (b) Coefficient of skewness and kurtosis
- (c) Absolute and factorial moments
- (d) Bayes theorem on probability. 4, 4, 4 1/2