

[This question paper contains 4 printed pages.]

8180

Your Roll No.....:

B.Sc. (G) / I

BS

MATHEMATICAL SCIENCES

Paper I Essentials of Operational Research (Statistics)

Time : 3 Hours

Maximum Marks : 55

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

Answer any Five questions.

1. (a) Find the mean deviation from the mean and standard deviation of A.P. : $a, a+d, a+2d, \dots, a+a+nd$ and verify that the latter is greater than the former. (5)
- (b) Karl Pearson's coefficient of skewness for a distribution is 0.32, its s.d. 6.5 and mean is 29.6. Find the mode of the distribution. (6)
2. (a) Calculate the first four moments of a distribution about the mean and hence find β_1 and β_2 .

x:	0	1	2	3	4	5	6	7	8
f:	1	8	28	56	70	56	28	8	1

(6)
- (b) An air-conditioning repair person claims that the probability is 0.82 that the motor is alright, 0.64

P.T.O.

that the fan is alright and 0.41 that they both are alright. Do you think that he is justified in his claim? Give reasons for your answer. (5)

3. (a) State Baye's Theorem for probability. The chances that doctor A will diagnose a disease X correctly is 60%. The chances that a patient will die by his treatment after correct diagnosis is 40% and the chance of death by wrong diagnosis is 70%. A patient of doctor A, who had disease X, died. What is the chance that his disease was diagnosed correctly. (6)

- (b) A random variable X has the probability distribution :

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

Find $E(X)$ and $E(X^2)$ and using the law of expectation, also evaluate $E(2X+1)^2$. (5)

4. (a) Derive Poisson distribution as the limiting case of Binomial distribution. (6)
- (b) With usual notations, find p for a binomial variate X, if $n = 6$, and $9 P(X=4) = P(X=2)$. (5)
5. (a) Define a uniform distribution. Find out the mean, variance and mean deviation about mean for a uniform distribution. (5)

- (b) For a distribution, the mean is 10, variance is 16, γ_1 is $-\frac{1}{2}$ and β_2 is 4. Obtain the first four moments about the origin. Comment about the nature of distribution. (6)
6. (a) In a distribution exactly normal, 7% of the items are under 35 and 89% are under 63. What are the mean and standard deviation of the distribution? (5)
- (b) If X is a normal variate with mean 30 and s.d. 5. Find the probabilities that
- (i) $26 \leq X \leq 40$ (ii) $X \geq 45$, and
(iii) $X - 30 > 5$ (6)
7. (a) A computer while calculating correlation coefficient between variables X and Y from 25 pairs of observations obtained the following results :
- $n = 25$, $\sum X = 125$, $\sum X^2 = 650$, $\sum Y = 100$, $\sum Y^2 = 460$,
 $\sum XY = 508$
- It was however later discovered at the time of checking that he had copied down two pairs (X, Y) as $(6, 14)$, $(9, 16)$, while the correct values were $(8, 12)$, $(6, 8)$. Obtain the correct value of correlation coefficient. (5)
- (b) The lines of regression in a bivariate distribution are : $X + 9Y = 7$ and $4X + Y = 49/3$. Find :
- P.T.O.

- (i) the coefficient of correlation
- (ii) the ratios $\sigma_x^2 : \sigma_y^2 : \text{Cov}(X, Y)$
- (iii) the means of the distribution (6)

8. Write short notes on any **two** of following :

- (a) Monte Carlo simulation
- (b) Characteristics of Markov Chain
- (c) Additive Property of Binomial distributive
(5½+5½)