

PROBABILITY & STATISTICS

(For students admitted in 2009, 2010, 2011, 2012 & 2013 batches only)

Time: 3 hours

Max. Marks: 60

Answer any FIVE questions
All questions carry equal marks

- 1 (a) (i) Write the axiomatic definition of probability.
(ii) Prove addition theorem on probability.
- (b) In a bolt factory machines A, B, C manufacture 20%, 30% and 50% of the total of their output and 6%, 3% and 2% are defective. A bolt is drawn at random and found to be defective. Find the probabilities that it is manufactured from:
(i) Machine A. (ii) Machine B. (iii) Machine C.

- 2 (a) A random variable X has the following probability function:

x	0	1	2	3	4	5	6	7
$P(x)$	0	k	$2k$	$2k$	$3k$	k^2	$2k^2$	$7k^2 + k$

Determine: (i) k (ii) Mean. (iii) Variance. (iv) The distribution function of X.

- (b) (i) Define continuous random variable.
(ii) The probability density function of the continuous random variable x is given by:

$$f(x) = \begin{cases} \frac{1}{4} & \text{for } 4 \leq x \leq 8 \\ 0 & \text{elsewhere} \end{cases}$$

Show that the area under the curve above x-axis is unity. Also find the mean of the distribution, where x denote the number of years.

- 3 (a) If 'X' is a Poisson variate such that $p(x=0) = p(x=1)$. Find $p(x=0)$ and using recurrence formula. Find the probabilities at $x = 1, 2, 3, 4$ and 5.
(b) Show that for the normal distribution mean, median and mode coincide.
- 4 (a) Determine the expected number of random samples passing their means:
(i) Between 22.39 and 22.41. (ii) > 22.42 . (iii) < 22.37 .
(iv) < 22.38 or more than 22.41 for the following data.
 $N =$ Size of the population = 1500, $n =$ Size of the sample = 36, Number of samples $N = 300$.
 $\sigma =$ population S.D = 0.48, $\mu =$ population mean = 22.4.
(b) Write the properties of F-distribution.

- 5 (a) The mean and S.D of a population are 11,795 and 14,054 respectively. What can one assert that 95% confidence about the maximum error if $\bar{x} = 11,795$ and $n = 50$? And also construct 95% confidence interval for the true mean.
(b) Construct a 99% confidence interval for the true mean weight loss if 16 persons on diet control after one month had a mean weight loss of 3.42 kgs with s.d of 0.68 kgs.

- 6 (a) Write about one tailed and two tailed tests.
(b) An ambulance service claims that it takes on the average less than 10 minutes to reach its destination in emergency calls. A sample of 36 calls has a mean of 11 minutes and the variance of 16 minutes. Test the significance at 0.05 level.

- 7 (a) A group of 5 patients treated with medicine A weigh 42, 39, 48, 60 and 41 kgs. Second group of 7 patients from the same hospital treated with medicine B weight 38, 42, 56, 64, 68, 69, 62 kgs. Do you agree with the claim that medicine B, increases the weight significantly.
(b) A firm manufacturing rivets wants to limit variations in their length as much as possible. The length (in cms.) of 10 rivets manufactured by a new process are:

21.5	1.99	2.05	2.12	2.17
2.01	1.98	2.03	2.25	1.93

Examine whether the new process can be considered superior to the old if the old population has S.D. 0.145 cm.

- 8 (a) Fit a parabola for the following data

X	1	2	3	4	5	6	7	8	9
Y	2	6	7	8	10	11	11	10	9

- (b) Explain the method of regression analysis.
