Roll No. ..... Total Pages : 06

BT-2/M-23 42037

PROBABILITY AND STATISTICS

BS-134A

Time : Three Hours] [Maximum Marks : 75

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks.

Unit I

1. (a) In a bolt factory, machines A, B and C manufacture 25%, 35% and 40% of the total product respectively, of their outputs 5%, 4% and 2% respectively are defective bolts. A bolt is drawn at random from the product and is found to be defective. What are the probabilities that it was manufactured by machines A, B or C ? 8

   (b) Three students A, B and C write an entrance examination. Their chances of passing are 1/2, 1/3 and 1/4 respectively. Find the probability that at least one of them passes. 7

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

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

(i) Find the value of the k

(ii) Evaluate P (X < 6), P (X ≥ 6)

(iii) P(0 < X < 5). 8

(b) A die is tossed thrice. A success is 'getting 1 or 6' on a toss. Find the mean and variance of the number of successes. 7

Unit II

3. (a) X is continuous random variable with a probability density function given by :

$F(x) = k\,x\ (0 \leq x < 2)$

$= 2\,k\ (2 \leq x < 4)$

$= -k\,x + 6\,k\ (4 \leq x < 6)$

Find k and the mean value of X. 8

(b) A variate X has the probability distribution

x	–3	6	9
$P(X = x)$	1/6	1/2	1/3

Find E(X) and $E(X^2)$. Hence evaluate $E(2X + 1)^2$ 7

4. (a) Fit a binomial distribution to the following frequency distribution : 8

x	f
0	13
1	25
2	52
3	58
4	32
5	16
6	4

(b) Fit a Poisson distribution to the set of observations : 7

x	f
0	122
1	60
2	15
3	2
4	1

Unit III

5. The distribution of age of males at the time of marriage is as follows :

Age (in years)	No. of males
18-20	5
20-22	18
22-24	28
24-26	37
26-28	24
28-30	22

Find at the time of marriage

(i) The average age

(ii) The Model age

(iii) The Median age. **15**

6. Find out the correlation between the 'height of the father' and the 'height of the son', from the following data : **15**

Height of father (in inches)	**Height of son (in inches)**
65	67
66	68
67	65

67	68
68	72
69	72
70	69
72	71

Unit IV

7. Use the method of least square, and fit a relation of the form $y = ab^x$ to the following data : **15**

x	:	2	3	4	5	6
y	:	144	172.8	207.4	248.8	298.5

8. (a) A random sample of 10 students' marks in Mathematics, and Statistics are given below. Test whether the correlation exists between the marks of the two subjects at a 5% level of significance. ($t_{0.05}$ = 2.36 for 08 degrees of freedom). **8**

Mark in Mathematics	**Marks in Statistics**
68	59
54	68
78	72
75	67
76	72

85	78
54	64
68	58
87	68
75	74

(b) A sample analysis of the examination results of 200 M.A. students was made. It was found that 46 students had failed, 68 secured third division, 62 secured second division and the rest were placed in the first division. Are these figues, commensurate with the general examination result which is in the ratio of 4 : 3 : 2 : 1 for various categories respectively ? $P(x^2 < 7.815) = 0.05$. 7