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BT-2/M-24 42037

PROBABILITY AND STATISTICS

Paper : 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 screw factory, machines A, B, C and D manufacture 20%, 15%, 25% and 40% of the total output respectively. Of their outputs 5%, 4%, 3%, and 2% respectively are defective. A screw 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, C or D ? **8**

(b) State and prove additive theorem of probability for n events. **7**

2. (a) A random variable X has the following probability function : 8

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

(i) Find the value of the k

(ii) Evaluate P (X < 6), P (X ≥ 6)

(iii) P (0 < X < 5)

(b) An integer is chosen at random from the first 200 positive integers. What is the probability that the integer chosen is divisible by 6 or 8 ? 7

Unit II

3. (a) X is a continuous random variable with a probability density function given by : 8

$$F(x) = kx \qquad (0 \le x < 2)$$
$$= 2k \qquad (2 \le x < 4)$$
$$= -kx + 6k \qquad (4 \le x < 6)$$

Find k and the mean value of X.

(b) The probability density function of X is : 7

$$f(x) = \begin{cases} a + bx^2, & 0 \le x \le 1 \\ 0 & \text{otherwise} \end{cases}$$

If E(X) = 3/5, find a and b.

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

x :	0	1	2	3	4	5
f :	2	14	20	34	22	08

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

x :	0	1	2	3	4
f :	46	38	22	9	1

Unit III

5. (a) Find the missing frequencies in the following distributions : **8**

Variable	Frequency
10–20	12
20–30	30
30–40	?
40–50	65
50–60	?
60–70	25
70–80	18

When its median is 46 and total frequency is 229.

(b) Find the value of Standard Deviation from the following table : **7**

Marks	No. of students
0–10	5
10–20	10
20–30	20
30–40	40
40–50	30
50–60	20
60–70	10
70–80	4

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 $y = a\,b^x$ 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' Mathematics and Statistics marks 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 figures, 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