BACHELOR OF TECHNOLOGY (CBCS - 2023)
B. Tech. Sem-II Computer Science & Engineering-AI & ML : WINTER : 2024
SUBJECT: PROBABILITY & STATISTICS

Day : Tuesday
Date : 26/11/2024

W-27703-2024

Time : 10:00 AM-01:00 PM
Max. Marks : 60

N.B :

1) All questions are **COMPULSORY**.
2) Figures to the right indicate **FULL** marks.
3) Use of non-programmable **CALCULATOR** is allowed.
4) Draw neat and labeled diagram **WHEREVER** necessary.
5) Assume suitable data if necessary.

Q.1 In a bolt factory machine A, B & C manufacture respectively 25%, 35% & 40% of the total production. Of their output 5, 4 & 2 percent are defective bolts. A bolt is drawn at random from the production and is found to be defective. What is the probability that it was manufactured by machine B? **(10)**

OR

Q.1 An urn contains 10 black and 5 white balls. Two balls are drawn from the urn one after the other without replacement. What is the probability that both drawn balls are black? **(10)**

Q.2 A random variable X has the following probability distribution: **(10)**

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

i) Find k,
ii) Evaluate $P(X < 6)$, $P(X \geq 6)$, and $P(0 < X < 5)$,
iii) If $P(X \leq c) > \frac{1}{2}$, find the minimum value of c, and
iv) Determine the distribution function of X.

OR

Q.2 For the adjoining bivariate probability distribution of X and Y, find: **(10)**

i) $P(X \leq 1, Y = 2)$,
ii) $P(X \leq 1)$,
iii) $P(Y \leq 3)$,
iv) $P(X < 3, Y \leq 4)$

Y→ X↓	1	2	3	4	5	6
0	0	0	1/32	2/32	2/32	3/32
1	1/16	1/16	1/8	1/8	1/8	1/8
2	1/32	1/32	1/64	1/64	0	2/64

Q.3 Fit a Poisson distribution to the following data: **(10)**

No. of mistakes per page	0	1	2	3	4	Total
No. of pages	109	65	22	3	1	200

OR

Q.3 $X \sim N(12, 4^2)$. **(10)**

a) Find out the probability of the following: (i) $X \geq 20$, (ii) $X \leq 20$, (iii) $0 \leq X \leq 12$.
b) Find x' when $P(X > x') = 0.24$

P.T.O.

Q.4 Calculate the correlation coefficient from the following data. (10)

X	23	27	28	29	30	31	33	35	36	39
Y	18	22	23	24	25	26	28	29	30	32

OR

Q.4 Ten competitors in a musical test were ranked by three judges A, B and C in the following order: (10)

A	1	6	5	10	3	2	4	9	7	8
B	3	5	8	4	7	10	2	1	6	9
C	6	4	9	8	1	2	3	10	5	7

Using rank correlation method, discus which pair of judges has the nearest approach to likings in music.

Q.5 Obtain the equations of two lines of regression for the following data. Also obtain the estimate of X for Y = 70. (10)

X	65	66	67	67	68	69	70	72
Y	67	68	65	68	72	72	69	71

OR

Q. 5 For 10 randomly selected observations, the following data were recorded: (10)

Observation No.	1	2	3	4	5	6	7	8	9	10
Overtime hrs. (X)	1	1	2	2	3	3	4	5	6	7
Additional units (Y)	2	7	7	10	8	12	10	14	11	14

Determine the coefficients of regression and regression equation using the non-linear form:

$$Y = a + b_1X + b_2X^2.$$

Q.6 In a trivariate distribution $\sigma_1 = 2, \sigma_2 = \sigma_3 = 3, r_{12} = 0.7, r_{23} = r_{31} = 0.5,$ Find (i) $r_{23.1}$ (ii) $R_{1.23}$ (iii) $b_{12.3}, b_{13.2}$ (10)

OR

Q. 6 Set up two-way ANOVA Table and test if there is any difference between the yield of different plots and if there is any difference in the performance of different fertilizers for the following data: (10)

Plots → Fertilizers↓	A	B	C	D
Nitrogen	6	4	8	6
Potash	7	6	6	9
Phosphate	8	5	10	9

Given F value for $v_1 = 3, v_2 = 6$ is 4.76 and for $v_1 = 2, v_2 = 6$ is 5.14, both at 5% level of significance.

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