

BACHELOR OF TECHNOLOGY (CBCS - 2023)
B. Tech. Sem-II COMPUTER SCIENCE & ENGINEERING AI & ML : SUMMER : 2024
SUBJECT: PROBABILITY & STATISTICS

Day : Thursday
 Date : 30/05/2024

S-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 Two dice are tossed. Find the probability of getting 'an even number on the first die' or 'a total of 8'. (10)

OR

Q.1 A man is known to speak truth 3 out of 4 times. He throws a die and reports that it is a six. Find the probability that it is actually a six. (10)

Q.2 Let X be a continuous random variable with p.d.f. (10)

$$f(x) = \begin{cases} ax, & 0 \leq x < 1 \\ a, & 1 \leq x < 2 \\ -ax + 3a, & 2 \leq x < 3 \\ 0, & \text{elsewhere} \end{cases}$$

Determine the constant 'a' and compute $P(X \leq 1.5)$.

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 →	1	2	3	4	5	6
X ↓						
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 A and B play a game in which their chances of winning are in the ratio 4:3. Find A's chance of winning at least 5 games out of the 7 games played. (10)

OR

Q.3 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) $|X - 30| > 5$. (10)

Q.4 A person while calculating $r(X, Y)$, 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 as (10)

(i)

X	Y
6	14
8	6

while the correct values were (ii)

X	Y
8	12
6	8

Obtain the correct value of correlation coefficient.

P.T.O.

OR

- Q.4 Obtain the rank correlation coefficient for the following data: (10)

X	68	64	75	50	64	80	75	40	55	64
Y	62	58	68	45	81	60	68	48	50	70

- 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 Find the regression equation of X_1 on X_2 and X_3 given the following results: (10)

Trait	Mean	Standard Deviation	r_{12}	r_{23}	r_{31}
X_1	28.02	4.42	+0.80		
X_2	4.91	1.10		-0.56	
X_3	594	85			-0.40

OR

- Q.6 To study the performance of three detergents and three different water temperatures. The following 'Whiteness' readings were obtained with specially designed equipment. Perform a two way analysis of variance, using 5% level of significance. (Given: $F_{0.05} = 6.94$). (10)

Water Temperature ↓	Detergent A	Detergent B	Detergent B
Cold	57	55	67
Warm	49	52	68
Hot	54	46	58

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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