

BACHELOR OF TECHNOLOGY (CBCS - 2023)
B. Tech. Sem-II Computer Science & Engineering AI & ML : SUMMER : 2025
SUBJECT: PROBABILITY & STATISTICS

Day : Friday
Date : 30/05/2025

S-27703-2025

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 A problem in Statistics is given to three students A, B and C whose chances of solving it are $\frac{1}{2}$, $\frac{3}{4}$ and $\frac{1}{4}$ respectively. What is the probability that the problem will be solved if all of them try independently? (10)

OR

Q.1 Bag I contains 3 red and 4 black balls while another Bag II contains 5 red and 6 black balls. One ball is drawn at random from one of the bags and it is found to be red. Find the probability that it was drawn from Bag II. (10)

Q.2 A continuous random variable x with p.d.f. $f(x) = 3x^2, 0 \leq x \leq 1$. Find 'a' and 'b' such that (10)
i) $P(X \leq a) = P(X > a)$,
ii) $P(X > b) = 0.05$

OR

Q.2 If X and Y are two random variables having joint density function: (10)

$$F(x, y) = \begin{cases} \frac{1}{8}(6 - x - y), & 0 \leq x < 2, 2 \leq y < 4 \\ 0, & \text{otherwise} \end{cases}$$

Find: $P(X < 1 \cap Y < 3)$, $P(X + Y < 3)$, $P(X < 1 | Y < 3)$.

Q.3 Seven coins are tossed and number of heads noted. The experiment is repeated 128 times and the following distribution is obtained: (10)

No. of heads	0	1	2	3	4	5	6	7
Frequencies	7	6	19	35	30	23	7	1

Fit a binomial distribution assuming that the coin is unbiased.

OR

Q.3 X is a normal variate with mean 30 and s.d. 5. Find the probabilities that (10)
(i) $26 \leq X \leq 40$, (ii) $X \geq 45$, and (iii) $|X - 30| > 5$.

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

P.T.O.

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, discuss 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 Fit an exponential curve of the form $Y = ab^x$ to the following: (10)

X	1	2	3	4	5	6	7	8
Y	1	1.2	1.8	2.5	3.6	4.7	6.6	9.1

- 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

where X_1 = seed per acre; X_2 = rainfall in inches and X_3 = accumulated temperature above 42° F.

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 →	A	B	C	D
Fertilizers ↓				
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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