

BACHELOR OF TECHNOLOGY (CBCS - 2023)
B. Tech. Sem-I CS&E : WINTER : 2023
SUBJECT : PROBABILITY & STATISTICS

Day : Wednesday

Time : 10:00 AM-01:00 PM

Date : 6/12/2023

W-27610-2023

Max. Marks : 60

N. B. :

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Draw neat and labelled diagrams **WHEREVER** necessary.
- 4) Use of non-programmable calculator is **ALLOWED**.
- 5) Assume suitable data, if necessary.

- Q. 1 a)** A problem in statistics is given to 3 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

- b)** Given 3 identical boxes I, II and III each containing 2 coins. In Box I, both coins are gold coins, in box II, both are silver coins and in the box III, there is one gold and one silver coin. A person chooses a box at random and takes out a coin. If the coin is of gold, what is the probability that the other coin in the box is also of gold?

- Q. 2 a)** A continuous r.v. X has a p.d.f. (10)
 $f(x) = 3x^2, 0 \leq x \leq 1$. Find 'a' and 'b' such that :

- i) $P(X \leq a) = P(X > a)$
- ii) $P(X > b) = 0.05$

OR

- b)** For the adjoining bivariate probability distribution of X and Y, Find:

- 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	$\frac{1}{32}$	$\frac{2}{32}$	$\frac{2}{32}$	$\frac{3}{32}$
1	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$
2	$\frac{1}{32}$	$\frac{1}{32}$	$\frac{1}{64}$	$\frac{1}{64}$	0	$\frac{2}{64}$

- Q. 3 a)** Fit a Poisson Distribution to the following data which gives the number of doddens in a sample of clover seeds: (10)

No. of doddens (x)	0	1	2	3	4	5	6	7	8
Observed frequency (y)	56	156	132	92	37	22	4	0	1

OR

- b)** $X \sim N(12, 4^2)$

- i) Find out the probability of the following:

- a) $X \geq 20$ b) $X \leq 20$ c) $0 \leq X \leq 12$

P. T. O.

ii) Find x' when $P(X > x') = 0.24$.

iii) Find x'_0 and x'_1 when

$$P(x'_0 < X < x'_1) = 0.50 \text{ and } P(X > x'_1) = 0.25.$$

Q. 4 a) The marks attained by 10 students in Mathematics (X) and Statistics (Y) are given below. Find the coefficient of correlation between X and Y. (10)

Roll No.	1	2	3	4	5	6	7	8	9	10
X	75	30	60	80	53	35	15	40	38	48
Y	85	45	54	91	58	63	35	43	45	44

OR

b) The value of Spearman's rank correlation coefficient for certain pairs of number of observations was found to be $2/3$. The sum of squares of the difference between corresponding ranks was 55. Find the number of pairs.

Q. 5 a) 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

OR

b) For 10 randomly selected observations, the following data were recorded:

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 coefficient of regression and regression equation using the non-linear form:

$$y = a + b_1 X + b_2 X^2$$

Q. 6 a) Find the regression equation of X_1 on X_2 and X_3 given the following results: (10)

Traits	Mean	Standard deviation	r_{12}	r_{23}	r_{31}
X_1	28.02	4.42	+0.80	-	-
X_2	4.91	110	-	-0.56	-
X_3	594	85	-	-	-0.40

OR

b) To study the performance of three detergents and three different water temperatures. The following 'Whiteness' readings were obtained with specially designed equipment. (10)

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

Perform a two way analysis of variance, using 5 % level of significance.

(Given : $F_{0.05} = 6.94$).

* * * * *