

**BACHELOR OF TECHNOLOGY (C.B.C.S.) (2021-COURSE)**  
**B. Tech. Sem - II CS&E :SUMMER- 2022**  
**SUBJECT : PROBABILITY & STATISTICS**

Day : Thursday  
Date : 28-07-2022

**S-24025-2022**

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) Assume suitable data if necessary.

- Q.1** Two unbiased dice are thrown. Find the probability that: **[10]**
- a) Both the dice show the same number.
  - b) The first dice show 6.
  - c) The total of numbers on the dice is 8.
  - d) The total of the numbers on the dice is greater than 8.
  - e) The total of the numbers on the dice is 13.

**OR**

- Q.1** Assume that a factory has two machines. Past records show that machine 1 produces 30% of the items of the output and machine 2 produces 70% of the items. Further 5% of the item produced by machine 1 were defective and only 1% produced by machine 2 were defective. If a defective items is drawn at random. What is the probability that it was produced by machine 1 and machine 2? **[10]**

- Q.2** A continuous random variables  $x$  with p.d.f.  $f(x) = 3x^2, 0 \leq x \leq 1$  **[10]**
- a) Check that  $f(x)$  is p.d.f.
  - b) Find  $a$  and  $b$  such that
    - i)  $P(X \leq a) = P(X > a)$
    - ii)  $P(X > b) = 0.05$

**OR**

- Q.2** Suppose that two dimensional continuous random variable  $(X, Y)$  has joint p.d.f. given by **[10]**
- $$f(x, y) = \begin{cases} 6x^2y & ; 0 < x < 1, 0 \leq y < 1 \\ 0 & ; \text{elsewhere} \end{cases}$$
- a) Verify that  $\int_0^1 \int_0^1 f(x, y) dx dy = 1$
  - b) Find  $P\left(0 < X < \frac{3}{4}, \frac{1}{3} < Y < 2\right), P(X+Y < 1), P(X > Y)$ .

- Q.3** 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
Frequencies (f)	56	156	132	92	37	22	04	00	01

**OR**

- Q.3**  $X$  is normally distributed and the mean of  $X$  is 12 and S.D. is 4. **[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 coefficient of correlation between  $X$  and  $Y$  for the following: [10]

<b>X</b>	1	3	4	5	7	8	10
<b>Y</b>	2	6	8	10	14	16	20

**OR**

- Q.4** Let the random variable  $X$  have the marginal density [10]

$$f_1(x) = 1, \quad -\frac{1}{2} < x < \frac{1}{2}$$

and let the conditional density of  $Y$  be

$$f(y/x) = \begin{cases} 1, & x < y < x+1, & -\frac{1}{2} < x < 0 \\ 1, & -x < y < 1-x, & 0 < x < \frac{1}{2} \end{cases}$$

Show that the variables  $X$  and  $Y$  are uncorrelated.

- Q.5** Obtain the equations of two lines of regression for the following data. Also obtain the estimate of  $X$  for  $Y = 70$ . [10]

<b>X</b>	65	66	67	67	68	69	70	72
<b>Y</b>	67	68	65	68	72	72	69	71

**OR**

- Q.5** Fit an exponential curve of the form  $Y = ab^X$  to the following data: [10]

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

- Q.6** In a trivariate distribution  $\sigma_1 = 2, \sigma_2 = \sigma_3 = 3, r_{12} = 0.7, r_{23} = r_{31} = 0.5$ . [10]  
Find: a)  $r_{23.1}$       b)  $R_{1.23}$       c)  $b_{12.3}, b_{13.2}$       d)  $\sigma_{1.23}$

**OR**

- Q.6** Find the regression equation of  $X_1$  on  $X_2$  and  $X_3$  and find  $\sigma_{1.23}, \sigma_{2.13}$  given the following data: [10]

Trait	Mean	S.D.	$r_{12}$	$r_{23}$	$r_{31}$
<b>X<sub>1</sub></b>	28.02	4.42	0.80	--	--
<b>X<sub>2</sub></b>	4.91	1.10	--	-0.56	--
<b>X<sub>3</sub></b>	594	85	--	--	-0.40

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