



DHARMSINH DESAI UNIVERSITY, NADIAD
FACULTY OF TECHNOLOGY
B.TECH. SEMESTER III [CE]
SUBJECT: (BS301) Probability and Statistics

Examination : External
Date : 09/11/2023
Time : 2 Hours

Seat No : _____
Day : Thursday
Max. Marks : 40

(10.00 to 12.00)

INSTRUCTIONS:

1. Answer each section in separate answer book.
2. Figures to the right indicate maximum marks for that question.
3. The symbols used carry their usual meanings.
4. Assume suitable data, if required & mention them clearly.
5. Draw neat sketches wherever necessary.

SECTION - I

Q.1 Do as directed.

[08]

CO 1

- (a) (i) A random variable X has a mean $\mu = 12$ and a variance $\sigma^2 = 9$. Prove that
 $P(6 < X < 18) \geq \frac{3}{4}$, using Chebyshev's Inequality.

A

(ii) Two aero planes bomb a target in succession. The probability of each correctly scoring a hit 0.3 and 0.2 respectively. The second will bomb only if the first misses the target. Find the probability that the target is hit.

CO 2

- (b) (i) Find the value of k , if the probability density function of a random variable X is: $f(x) = \frac{k}{1+x^2}; -\infty \leq x \leq \infty$.

A

(ii) In a distribution, the mean $\mu = 65$, median = 70, coefficient of skewness = -0.6 Find the mode and coefficient of variation.

Q.2

Attempt *Any TWO* from the following questions.

[08]

- (a) Derive the relation between central moments and raw moments. Hence find the four moments about mean, if the first four moments of distribution about $x = 2$ are 1, 2.5, 5.5, and 16.
- (b) Given the following probability function of a discrete random variable X :

X	0	1	2	3	4	5	6	7
$P(X)$	0	C	$2C$	$2C$	$3C$	C^2	$2C^2$	$7C^2 + C$

CO 1

Find (i) C (ii) $P(X > 5)$ (iii) $P(X < 6)$ (iv) K if $P(X \leq K) > 0.5$, where K is a positive integer.

A

- (c) Ten competitors in a musical test were ranked by the three judges A, B, and C in the following order:

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

Using the rank correlation method, find which pair of judges has the nearest approach to common liking in music.

Q.3
CO 2
A

- (a) The following are scores of two batsmen A and B in a series of innings: [4]

A	12	115	6	73	7	19	119	36	84	29
B	47	12	16	42	4	51	37	48	13	00

Who is the better score getter and who is more consistent?

OR

Q.3
CO 2
A

- (a) If the joint probability mass function of (X, Y) is given by: [4]

$$P_{XY}(x, y) = k(2x + 3y), x = 0, 1, 2; y = 1, 2, 3$$

Find all the marginal probability distribution. Also, find the value of "k" and $P(X + Y \geq 4)$.

SECTION - II

Q.4

Do as directed.

[08]

CO 3
A

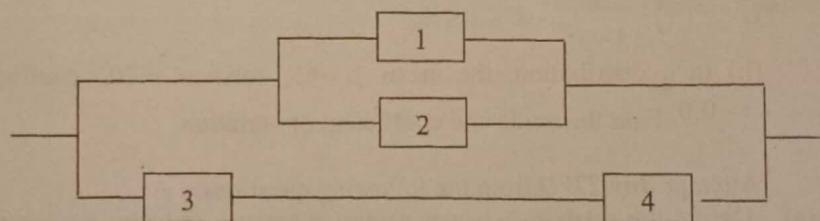
- (a) (i) Three cities A, B, C are equidistant from each other. A motorist travels from A to B at 30 km/hr, from B to C at 40 km/hr, from C to A at 50 km/hr. Determine the average speed.

(ii) The probability that there is at least one error in a program statement prepared by A is 0.2 and for B and C, they are 0.25 and 0.55 respectively. A, B, and C prepared 10, 16, and 20 statements respectively. Find the expected number of correct statements in all.

CO 4
A

- (b) (i) If 10% of the screws produced by a machine are defective, using Binomial distribution, find the probability that out of 5 screws chosen at random, none is defective.

(ii) The probability that the component works $(1, 2, 3, 4) = 0.9$ What is the probability that the following entire system works:



Q.5

Attempt *Any TWO* from the following questions.

[08]

CO 3
A

- (a) Find the mean and standard deviation in which 7% of items are under 35 and 11% are above 63:

$$[\phi(1.48) = 0.43 \text{ and } \phi(1.23) = 0.39]$$

- (b) Of three persons the chances that a politician, a businessman, or an academician would be appointed as the Vice Chancellor (VC) of a university are 0.5, 0.3, and 0.2 respectively. Probabilities that research is promoted by these persons if they are appointed as VC are 0.3, 0.7, and 0.8 respectively.

(i) Determine the probability that research is promoted.

(ii) If research is promoted, what is the probability that the VC is an academician?

- (c) The joint pdf of (X, Y) is given by

$$f(x, y) = ke^{-x} \cos y, 0 \leq x \leq 2, 0 \leq y \leq \frac{\pi}{2}$$

= 0, otherwise.

Find (i) k (ii) $P\left(X + Y \geq \frac{\pi}{2}\right)$.

Q.6 (a) Calculate Karl Pearson's coefficient of correlation for the data given below: [4]
CO 4

X	10	14	18	22	26	30
Y	18	12	24	6	30	36

OR

Q.6 (a) Show that for the symmetrical distribution $f(x) = \frac{2a}{\pi} \left(\frac{1}{a^2 + x^2} \right)$, $-a \leq x \leq a$ [4]
CO 4

A
$$\mu_2 = \frac{a^2(4 - \pi)}{\pi}.$$

Blooms Taxonomy: R-Remembering, U-Understanding, A-Applying, N-Analyzing, E-Evaluating, C-Creating.