



Department of Mathematics
Continuous Assessment Test II

Subject	: Probability and Statistics	Subject Code	: MA8391
Year / Semester	: II / IV	Time	: 1 ½ Hrs
Branch	: IT	Marks	50
Date / Session	: 21.04.2021 / FN		

Answer **all** the questions

Part – A (5 x 2 = 20)

1. Let X and Y have joint pdf $f(x, y) = 2, 0 < x < y < 1$, find the marginal distribution of X. (R) (CO1)
2. If X and Y are independent random variables, show that they are uncorrelated. (U) (CO1)
3. Define the Angle between the regression lines. (R) (CO1)
4. Write the formula for regression lines. (R) (CO1)
5. State Central Limit Theorem. (R) (CO6)

Part – B (2 x 16 + 1 x 2 = 40)

6. a) i) The joint probability mass function of (X, Y) is given by $p(x, y) = k(2x + 3y)$,
 $x = 0, 1, 2; y = 1, 2, 3$ Find the marginal distribution and conditional distribution of X/Y=1. Also find the probability of $X + Y$. (8) (R) (CO1)

- a) ii) Two random variables X and Y have the joint density

$$f(x, y) = \begin{cases} 2 - x - y, & 0 < x < 1, 0 < y < 1 \\ 0, & \text{otherwise} \end{cases} \text{ Show that } \text{cor}(X, Y) = \frac{-1}{144}$$

(8) (A) (CO1)

(OR)

6. b) i) The joint pdf of the random variable (X, Y) is given by

$$f(x, y) = kxye^{-(x^2+y^2)}, x, y > 0. \text{ Find } k. \text{ Prove that } X \text{ and } Y \text{ are independent.}$$

(8) (R) (CO1)

- b) ii) The random variable (X, Y) has the pdf $f(x, y) = \begin{cases} x + y: 0 < x < 1, 0 < y < 1 \\ 0: & \text{otherwise} \end{cases}$

Compute $r(X, Y)$.

(8) (AN) (CO1)

7. a) i) Calculate the correlation coefficient for the following heights in inches of fathers (x) and their sons (y)

(8) (AN) (CO1)

x	65	66	67	67	68	69	70	72
y	67	68	65	68	72	72	69	71

- a) ii) The independent random variables X and Y follow exponential distribution with parameter $\lambda = 1$. Find the p.d.f of $U = X - Y$.

(8) (A) (CO1)

(OR)

7. b) i) In a correlation analysis the equations of the two regression lines are

$$3x + 12y = 19 \text{ and } 3y + 9x = 46. \text{ Find the (i) Mean of } X \text{ and } Y.$$

(ii) The value of the correlation co-efficient.

(8) (A) (CO1)

- b) ii) If the joint pdf of (X, Y) is given by $f(x, y) = x + y; 0 < x, y < 1$, find the pdf of $U = XY$.

(8) (A) (CO1)

8. a) The life time of a particular variety of electric bulbs may be considered as a random variable with mean 1200 hours and standard deviation 250 hours. Using Central limit theorem find the probability that average life time of 60 bulbs exceeds 1250 hours.

(8) (A) (CO6)

(OR)

8. b) A sample of size 100 is taken from a population whose mean is 60 and variance is 400. Using central limit theorem, with what probability can we assert that the mean of the sample will not differ from $\mu = 60$ by more than 4?

(8) (A) (CO6)

Course Outcomes:

- CO1:** Understand the fundamental knowledge of the concepts of probability and have knowledge of standard distributions, one dimensional and two dimensional random variables which can describe real life phenomenon.
- CO2:** Apply Baye's theorem to Engineering problem like Data telecasting in Information and Technology, Trend analysis concepts in Data analytics.
- CO3:** Testing the significant difference between sample statistic and population parameter for small and large samples in real life problems, Analyse one way and two-way classification.
- CO4:** Apply the basic concepts of classifications of design of experiments Latin square and factorial Design in the field of agriculture.
- CO5:** Apply the fundamentals of quality control and the methods used to control systems and processes.
- CO6:** Analyze the concept of probability distribution and Statistical techniques.

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