



**School of Advanced Sciences
Department of Mathematics
Continuous Assessment Test – I
Fall Semester 2023-24**

Programme Name & Branch: M.C.A

Slot: D1+TD1 **Semester:** I

Course Code: PMAT501L

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Exam Duration: 90 mins

Maximum Marks: 50

Course Title: Probability and Statistics

Class Number: 6405

General instructions: Answer all the questions (5X10=50 Marks)

1. (a) The probability that a regularly scheduled flight departs on time is $P(D) = 0.83$; the probability that it arrives on time is $P(A) = 0.82$; and the probability that it departs and arrives on time is $P(D \cap A) = 0.78$. Find the probability that a plane (i) arrives on time given that it departed on time, and (ii) departed on time given that it has arrived on time. (5M)

- (b) Suppose that we have a fuse box containing 20 fuses, of which 5 are defective. If 2 fuses are selected at random and removed from the box in succession without replacing the first, what is the probability that both fuses are defective? (5M)

2. A manufacturing firm employs three analytical plans for the design and development of a particular product. For cost reasons, all three are used at varying times. In fact, plans 1, 2, and 3 are used for 30%, 20% and 50% of the products respectively. The "defect rate" is different for the three procedures as follows: $P(D/P_1) = 0.01$, $P(D/P_2) = 0.03$, $P(D/P_3) = 0.02$, where $P(D/P_j)$ is the probability of a defective product, given plan j . If a random product was observed and found to be defective, which plan was most likely used and thus responsible? (10M)

3. A discrete Random variable X has the following probability distribution.

$x: 0 \quad 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 7 \quad 8$

$p(x): a \quad 3a \quad 5a \quad 7a \quad 9a \quad 11a \quad 13a \quad 15a \quad 17a$

Find the value of a , $P(X < 3)$, mean, variance and cumulative distribution function of X . (10M)

4. The Joint density for the random variables (X, Y) , where X is the unit temperature change and Y is the proportion of spectrum shift that a certain atomic particle produces, is

$$f(x, y) = \begin{cases} 10xy^2, & 0 < x < y < 1 \\ 0, & \text{elsewhere} \end{cases}$$

- (a) Find the marginal densities $g(x)$, $h(y)$ and the conditional density $f(y/x)$.

- (b) Find the probability that the spectrum shifts more than half of the total observations, given that the temperature is increased to 0.25 unit. (10M)

5. Let X and Y be the random variables with joint probability distributions: (10M)

x	0	1	2
y			
0	$\frac{3}{28}$	$\frac{9}{28}$	$\frac{3}{28}$
1	$\frac{3}{14}$	$\frac{3}{14}$	0
2	$\frac{1}{28}$	0	0

Find the expected values $E(X)$, $E(Y)$, $E(XY)$, Marginal distributions and Covariance of X and Y .