INFINITY
THINK BEYOND...........

AN EDUCATIONAL INSTITUTE

SUBJECT:MATHS

DATE : 25/11/24

PBMT – 05

UNIT – 5 LINEAR PROGRAMMING
Ch –12 linear programming
UNIT – 6 PROBABILITY
Ch –13 Probability

MAX. MARKS : 30

DURATION : 60 MIN

General Instruction:

This Question Paper has 5 Sections A-E.

1. Section A has 6 MCQs carrying 1 mark each.

2. Section B has 2 questions carrying 02 marks each.

3. Section C has 2 questions carrying 03 marks each.

4. Section D has 1 questions carrying 04 marks each.

5. Section E has 2 questions carrying 05 marks each .

Draw neat figures wherever required. Take π =22/7 wherever required if not stated.

SECTION – A

Questions 1 to 6 carry 1 mark each.

1. A die is thrown once . Let A be the event that the number obtained is greater than 3. Let B be the event that the number obtained is less than 5. Then, P(A U B) is

(a) $\frac{2}{5}$　　　　　(b)$\frac{3}{5}$　　　　　(c) 0　　　　(d) 1

2. Corner points of the feasible region determined by the system of linear constraints are (0,2) , (3,0) ,(6,0) , (6,8) and (0,5) .Let Z = 4x + 6y be the objective function .The minimum value of Z occurs at :

(a) (6,8) only　　　　　　　　(b) (3,0) only

(c) (0,2) only　　　　　　　　(d) any point of the line joining the points (0,2) and (3,0)

3. Given two independent events A and B such that P (A) = 0.3, P (B) = 0.6 and P(A′ ∩ B′) is

(a) 0.9　　　　(b) 0.18　　　　(c) 0.28　　　　(d) 0.1

4. If P(A) = 0.8, P(B) = 0.5 and P$\left(\frac{B}{A}\right)$ = 0.4, then P(A∩B) is:

(a) 0.15　　　　(b) 0.23　　　　(c) 0.32　　　　(d) 0.51

5.Corner points of the feasible region determined by the system of linear constraints are (0,3) , (1,1) , and (3,0) .Let Z = px + qy ,where p,q > 0.Condition on p and q so that the minimum of Z occurs at (3,0) and (1,1) is

(a) p = 2q　　　　(b) p = $\frac{q}{2}$　　　　(c) p = 3q　　　(d) p = q

6. Assertion (A): If A and B be two events in a sample space such that P(A) = 0.3, P(B) = 0.3 then $P(A \cap \bar{B})$ can't be found.

Reason (R): $P(A \cap \bar{B})$= P(A) - P(A∩B)

(a) Both 'A' and 'R' are true and 'R' is the correct explanation of 'A'.

(b) Both 'A' and 'R' are true but 'R' is not the correct explanation of 'A'.

(c) 'A' is true but 'R' is false.

(d) 'A' is false but 'R' is true

SECTION – B
Questions 7 to 8 carry 2 mark each.

7. Prove that if E and F are independent events ,then the events E' and F' are also independent.

Or

Suppose, a girl throws a die. If she gets a 5 or 6, she tosses a coin three times and notes the number of heads. If she gets 1,2,3 or 4 she tosses a coin once and notes whether a head or tail is obtained. If she obtained exactly one head, what is the probability that she threw 1,2,3 or 4 with the die?

8. There are three coins. One is a two – headed coin (having head on both faces), another is a biased coin that comes up heads 75% of the times and third is also a biased coin that comes up tails 40% of the times. One of the three coins is chosen at random and tossed, and it shows head. What is the probability that it was the two – headed coin?

SECTION – C
Questions 9 to 10 carry 3 mark each.

9. The random variable X has a probability distribution P(X) of the following form, where k is some number

$$P(X) = \begin{cases} k, & if\ x = 0 \\ 2k, & if\ x = 0 \\ 3k, & if\ x = 2 \\ 0, & otherwise \end{cases}$$

(i) Determine the value of k
(ii) Find P(X < 2) , P(X ≤ 2) , $P(X \geq 2)$.

10. Find the mean number of defective items in a sample of two items drawn one-by-one without replacement from an urn containing 6 items, which include 2 defective items. Assume that the items are identical in shape and size.

Or

A speaks truth in 70% of the cases and B speaks truth in 80 % of the cases .In what percentage of the cases:
(i) they contradict each other in stating the same fact?
(ii)they agree each other in stating the same fact?

SECTION – D
Questions 11 carry 4 mark each.

11. A departmental store sends bills to charge its customers once a month. Past experience shows that 70% of its customers pay their first month bill in time. The store also found that the customer who pays the bill in time has the probability of 0.8 of paying in time next month and the customer who doesn't pay in time has the probability of 0.4 of paying in time the next month.
Based on the above information, answer the following questions :
(i) Let E_1 and E_2 respectively denote the event of customer paying or not paying the first month bill in time. Find $P(E_1) : P(E_2)$.
(ii) Let A denotes the event of customer paying second month's bill in time, then find $P(A/E_1)$ and $P(A/E_2)$.
(iii) Find the probability of customer paying second month's bill in time.

SECTION – E
Questions 12 to 13 carry 5 mark each

12. Solve the following problem graphically :
Minimise and Maximise Z = 3x + 9y

Subject to the constraints :

$x + 3y \leq 60$

$x + y \geq 10$

$x \leq y$

$x \geq 0 , y \geq 0$

13. A Bag I contains 5 red and 4 white balls and a Bag II contains 3 red and 3 white balls. Two balls are transferred from the Bag I to the Bag II and then one ball is drawn from the Bag II. If the ball drawn from the Bag II is red, then find the probability that one red and one white ball are transferred from the Bag I to the Bag II.

_____**End**_____

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