Seat No. : _____

NH-104

November-2025

B.S.(BCA), Sem.-V

DSC-M-BCA-354T : Foundation of Mathematical Applications

(NEP-2020)

Time : 2:00 Hours] **[Max. Marks : 50**

1. Answer the following :

   (1) What is Set ? Explain different types of set with example. **5**

   (2) $f(x) = x + x^2$, then $f(a + 1) + f(a - 1)$. **5**

   OR

   (1) If $A = \{2, 4, 6, 8\}$, $B = \{1, 2, 3, 4\}$ and $C = \{2, 3, 7\}$ & $U = \{1, 2, 3, 4, 5, 6, 7, 8\}$. Verify the following results :

   (i) $A \cup (B \cap C) = (A \cup B) \cap (A \cap C)$

   (ii) $(A \cup B)' = A' \cap B'$ **5**

   (2) Let $A = \{0, 1, 2\}$ and $B = \{0, 1, 2, 3, 4, 5\}$. Consider a rule, $f(x) = x^2$, write domain, co-domain and Range. **5**

2. Answer the following :

   (1) Let $A = \{1, 2, 3, 4, 6\}$ and Let R be the relation on A defined by "x divides y".

   (i) Write R as a set of ordered pair

   (ii) Check Equivalence relation or not ? **5**

   (2) Draw the Hasse diagram representing the partial ordering $\{(a, b) / a \text{ divides } b\}$ on $\{1, 2, 3, 4, 6, 8, 12\}$. **5**

   OR

   (1) Let $A = \{1, 2\}$, $B = \{a, b, c\}$ and $C = \{c, d\}$. Find $(A \times B) \cap (A \times C)$ and $(B \cap C)$. **5**

   (2) Express Boolean function $f(x, y, z) = x + yz$ in sum of minterms. **5**

3. Answer the following :

(1) Let $u = \begin{bmatrix} 5 \\ 3 \\ 4 \end{bmatrix} v = \begin{bmatrix} -1 \\ 5 \\ 2 \end{bmatrix}$, find $5u - 2v$. **5**

(2) Determine whether the following proposition is tautology or not.

$\{(p \vee \sim q) \wedge (\sim p \vee \sim q)\}$ **5**

OR

(1) Let $A = \begin{bmatrix} 2 & -1 \\ 4 & 2 \end{bmatrix} B = \begin{bmatrix} 4 & 3 \\ -2 & 1 \end{bmatrix}$ & $C = \begin{bmatrix} -2 & -3 \\ -1 & 2 \end{bmatrix}$

(i) A + B

(ii) B + C **5**

(2) Show equivalence of the following :

$p \vee (q \vee r)$ and $(p \vee q) \wedge (p \vee r)$ **5**

4. Answer the following :

(1) Prove that : $\begin{bmatrix} 17 \\ 6 \end{bmatrix} = \begin{bmatrix} 16 \\ 5 \end{bmatrix} + \begin{bmatrix} 16 \\ 6 \end{bmatrix}$ **5**

(2) Two cards are drawn at random from an ordinary deck of 52 cards.

Find the probability P that :

(i) Both are spades

(ii) One is a spade and one is heart. **5**

OR

(1) Show that :

$C(2n, 2) = 2C(n, 2) + n^2$ **5**

(2) An urn contain 9 red, 7 white and 4 black balls. A ball is drawn at random. What is the probability that the ball drawn will be :

(A) Red

(B) White

(C) White or black

(D) Red or black ? **5**

5. Answer the following : (Any **ten**) **10**

(1) _____ is an unordered collection of element where an element can occur as a member more than once.

(A) Multiset (B) Ordered set

(C) Set (D) None of these

(2) The number of different permutation of word RADAR is :

(A) 60 (B) 30

(C) 120 (D) 50

(3) The rank of Matrix $\begin{bmatrix} 1 & 1 \\ 2 & 3 \end{bmatrix}$ is :

(A) 2 (B) 4

(C) 0 (D) 1

(4) Let A = {1, 2, 4}, find P(A).

(5) Let U = {1, 2, 3, 4, 5} and A = {2, 3} find A^c.

(A) {1, 4, 6} (B) {2, 4, 6}

(C) {1, 4, 5} (D) {2, 3}

(6) Define Baye's theorem.

(7) Define one-one function.

(8) Calculate !0 is

(A) 0 (B) 1

(C) 2 (D) 3

(9) Every matrix is a null matrix. [T/F]

(10) Define Venn diagram.

(12) The number of elements in the power set P(S) of the set S = {{0}, 1, {2, 3}} is :

(A) 2 (B) 4

(C) 8 (D) None of these
