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**B.M.S COLLEGE FOR WOMEN, AUTONOMOUS
BENGALURU – 560004**

I SEMESTER END EXAMINATION – JAN/FEB -2024

**B.C.A & B.VOC-IT : DISCRETE STRUCTURES
(NEP Scheme 2021-22 onwards F+R)**

**Course Code: BCA1DSC01/BVIT1DSC01
Duration: 2 ½ Hours**

**QP Code: 1030/1033
Max marks: 60**

Instructions: Answer all the sections.

SECTION-A

I. Answer any SIX of the following. Each question carries TWO marks. (6x2=10)

1. Write the following in Roaster form:
 $A = \{x: x \in N \text{ and } 7 \leq x \leq 13\}$.
2. If $A = \{1, 2, 3\}$ and $B = \{4, 3\}$ find $B \times A$.
3. Define contradiction.
4. Write the Truth Table of $p \rightarrow q$.
5. In Bangalore City, 6 newspapers and 3 magazines are printed. Rajesh wants to subscribe 1 newspaper or 1 magazine. How many choices does he have?
6. Let $X = \{2, 4, 6\}$ and $Y = \{4, 6, 8\}$, $R \subseteq X \times Y$ given by
 $R = \{(2,2), (2,4), (2,6), (2,8), (4,4), (6,6), (8,8)\}$ represents the relation by di-graph.
7. Define skew symmetric matrix with an example.
8. If $A = \begin{bmatrix} 2 & 5 \\ -3 & 7 \end{bmatrix}$ then find determinant of A.

SECTION-B

II. Answer any SIX full of the following. Each question carries EIGHT marks. (6x8=20)

1. (a) If $U = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$ is the universal set
 $A = \{2, 3, 4, 8\}$, $B = \{1, 3, 4\}$ and $C = \{3, 4, 5, 6\}$
Verify: i) $(A \cap B)' = A' \cup B'$

ii) $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$.

(b) If f and g are functions, $f, g : R \rightarrow R$ defined by $f(x) = 3x + 8$ and $g(x) = x^2$, then find composite functions $f \circ g$ and $g \circ f$.

2. (a) A relation on the set of integers defined by $R = \{(x, y) \mid x - y \text{ is a multiple of } 5\}$. Show that R is an equivalence relation on Z .

(b) Let $g: R \rightarrow R$ is defined by $g(x) = 3x + 4$, prove that g is one - one and onto.

3. (a) Show that $(p \leftrightarrow q)$ and $(p \rightarrow q) \wedge (q \rightarrow p)$ are logically equivalent.

(b) Write converse, inverse and contrapositive of “ If two triangles are equiangular then they are similar”.

4. (a) Verify the proposition $\sim(p \wedge q) \wedge (q \rightarrow p)$ is a tautology or not.

(b) If the compound proposition $(p \wedge q) \rightarrow r$ is given to be false, find the truth values of p, q and r .

5. (a) (i) If $C(n, r) = 56, P(n, r) = 336$, find n & r .

(ii) In how many ways the letters of the word “MATHEMATICS” be arranged?

(b) From 8 gentlemen and 4 ladies a committee of 5 is to be formed. In how many ways can this be done so as to include atleast 1 lady

6. (a) Explain Binary Search with an example.

(b) Find the coefficient of x^5 in the expansion of $(x + 3)^8$

7. (a) Find the inverse of $A = \begin{bmatrix} 1 & 2 & 3 \\ 1 & 3 & 3 \\ 1 & 2 & 4 \end{bmatrix}$.

(b) Find x if $y = \begin{bmatrix} 3 & 2 \\ 1 & 4 \end{bmatrix}$ and $2x + y = \begin{bmatrix} 1 & 0 \\ -3 & 2 \end{bmatrix}$.

8. (a) Solve the system of equations using Cramer’s rule for

$$x - y + 2z = 7, 3x + 4y - 5z = -5, 2x - y + 3z = 12.$$

(b) Find the Eigen values for the matrix, $A = \begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$.
