



BRAINWARE UNIVERSITY

Course – BAMW

Discrete Structures (BMWC102)

(Semester – 1)

Time allotted: 3 Hours

Full Marks : 70

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group –A

(Multiple Choice Type Question)

1. Choose the correct alternatives for **any ten** of the following: **1 x 10 = 10**
- i) If a relation R defined on a set $A = \{1, 2, 3\}$ such that $R = \{(1, 1), (1, 2), (2, 1)\}$, then R is
 - a) Symmetric only
 - b) Transitive only
 - c) both a and b
 - d) None of these .
 - ii) If $A = \{\{1\}, \{2\}, \{3\}\}$ then Cardinality number of power set of A is
 - a) 7
 - b) 8
 - c) 6
 - d) None of these.
 - iii) Let $P(n): 5^n + 4^n$ is divisible by 9. The truth value of $P(1) \rightarrow P(2)$ is
 - a) True
 - b) False
 - iv) If $A = \{a, i, e, l, t\}$ and $B = \{a, t, u, e\}$ then the set $(A - B) \cup (B - A)$ is
 - a) $\{a, t, e\}$
 - b) $\{i, l, u\}$
 - c) $\{\}$
 - d) None of the above.
 - v) If A and B are two matrix then $(AB)^t$ is
 - a) $A^t B^t$
 - b) $B^t A^t$
 - c) AB
 - d) None of these

- vi) $[\sim p \vee (p \rightarrow q)] \rightarrow p$ is
 a) Tautology b) Contingency
 c) Contradiction d) Valid
- vii) A circuit less connected graph is called
 a) Multi graph b) Tree
 c) Pseudo graph d) None of the above
- viii) Matrix multiplication is commutative
 a) true b) false
- ix) Null set is subset of every set.
 a) true b) false
- x) Total degree of a graph can not be even
 a) true b) false
- xi) Product of three consecutive natural number is always divisible by 6
 a) true b) false

Group – B

(Short Answer Type Question)

3 x 5 = 15

Answer any **three** of the following.

2. Prove by mathematical induction that $1^3 + 2^3 + 3^3 + \dots + n^3 = n^2(n+1)^2/4$. for all positive integer n
3. Prove that $(A \cup B)^c = A^c \cap B^c$. (Without using Venn diagram)
4. Explain Bipartite graph with example.
5. In a class of 100 students, 35 like science and 45 like math. 10 like both. How many like either of them and how many like neither?

Group – C

(Long Answer Type Question)

3 x 15 = 45

Answer any **three** of the following.

6. i) A mapping function $f: R \rightarrow R$ is defined as $f(x) = x^2 - 1$, $x \in R$ show that f is neither surjective and nor injective.
- ii) Prove that for any positive integer number n , $n^3 + 2n$ is divisible by 3 . 7 + 8

7. i) Solve the following system of equations by Matrix inversion method.

$$x+y+z=6$$

$$x-y+z=2$$

$$3x-5y-z=-10$$

ii) Draw the graph from the following adjacency matrix.

	A	B	C	D	E	F
A	0	1	1	1	0	0
B	1	0	0	0	1	1
C	1	0	0	0	0	1
D	1	0	0	0	0	0
E	0	1	0	0	0	0
F	0	1	1	0	0	0

8 + 7

8. i) Compute CNF and DNF for the following expression.

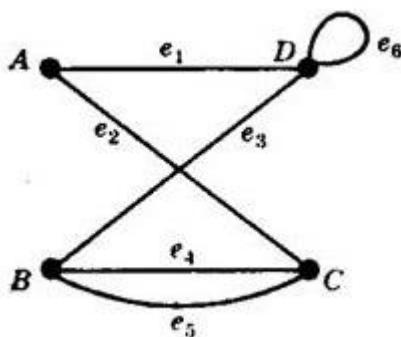
$$((p \rightarrow \sim q) \leftrightarrow r) \rightarrow (r \vee p)$$

ii) Find the inverse of the following matrix.

$$A = \begin{pmatrix} 2 & 1 & 1 \\ -5 & -3 & 0 \\ 1 & 1 & -1 \end{pmatrix}$$

8 + 7

9. i) Generate the incidence matrix for following graph



ii) A relation R defined on a set R such that “ a R b iff a.b>0 for a,b ∈ R ”, whether R is reflexive, symmetric or transitive.

7+ 8