S.NO: 22N1-UM **Subject Code: XVGI**

A.D.M.COLLEGE FOR WOMEN, NAGAPATTINAM

(AUTONOMOUS)

B. Voc (SOFTWARE DEVELOPMENT IN MULTIMEDIA & ANIMATION)
DEGREE EXAMINATION
III Semester – November 2022

GCC III – DISCRETE MATHEMATICS

Time: 3 hours **Maximum Marks: 75**

Section –A **10X2=20**

Answer **ALL** the Questions:

1. Define a set and give an example

2. State DeMorgan's law.

3. Define a bijective function.

4. Define equivalence relation.

5. Define a monoid.

6. Show that $\{1, -1, i, -i\}$ is a group under multiplication.

7. Given an example of a graph.

8. Define adjacency matrix in a graph.

9. Define a tree.

10. Define minimal spanning tree.

Section –B **5X5=25**

Answer **ALL** the Questions:

11. a) Use Venn diagram, Prove that $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$

(or)

b) State whether the formula $(P \rightarrow Q) \leftrightarrow \neg P \vee Q$ is tautology or not.

12. a) Explain the one-one and onto functions.

(or)

b) Represent the relation $R = \{ (1,2), (1,3), (1,4),(2,3),(4,4) \}$ by a digraph.

13. a) For any commutative monoid $(M, *)$, Prove that the set of idempotent elements is a submonoid.

(or)

b) Show that the set G of all matrices of the form $\begin{pmatrix} a & a \\ a & a \end{pmatrix}$ where $a \in R^*$ is a group under multiplication.

14. a) Let $G = (V,E)$ be a graph. Prove that the number of vertices of odd degree is even.

(or)

b) Write the properties of the incidence matrix.

15. a) Let $T = (V,E)$ be a tree with n vertices. Prove that there is a unique path between every two distinct vertices of T.

(or)

b) Explain the rooted and binary trees.

Section –C $\qquad$ 3 X 10 = 30

Answer any **THREE** Questions:

16. Construct the truth table for the formula

$$\alpha = (P \rightarrow (Q \rightarrow R)) \rightarrow ((P \rightarrow Q) \rightarrow (P \rightarrow R))$$

17. (i) Define a relation matrix.

(ii) Let A ={ 1,2,3,4,5,6}. Define aRb if a-b is divisible by 2, aSb if $a \leq b$ and aTb if a=b. Find the relation matrices of R, S and T.

18. (i) Find all subsemigroups of $(Z_6 , \times_6)$ having at most 2 elements. Show that there exists a subsemigroup which is not a submonoid of Z_6.

(ii) Define a semigroup homomorphism.

19. Explain the various operations on graphs.

20. (i) Define spanning tree.

(ii) Prove that a graph G is connected if and only if G contains a spanning tree.