

SARASWATHI NARAYANAN COLLEGE
(Autonomous Institution Affiliated to Madurai Kamaraj University)
(Reaccredited with Grade 'B' by NAAC)
Madurai – 625 022.

M.Sc., Mathematics – Summative Examinations – November 2023
Code: : **LPMSSC32** **Semester: III**
GRAPH THEORY AND COMBINATORICS
Duration: 2 Hrs. Max: 50 Marks

SECTION – A

$5 \times 1 = 5$

Answer ALL questions. Choose the correct answer.

1. How many 4-digit numbers can be formed by using 2, 4, 6, 8, 10, 12 without repetition of digits?
a) 70 b) 127
c) 15 d) 42
2. Set A has 3 elements and set B has 4 elements then number of injections defined from A to B are is
a) 12 b) 24
c) 36 d) 48
3. If two vertices in a graph are connected by an edge, then the vertices are
a) adjacent b) incident
c) neutral d) finite.
4. A _____ is an undirected graph in which any two vertices are connected by at most one path.
a) forest b) walk
c) tree d) leaves
5. Which of the following are posets?
a) $(\mathbb{Z}, =)$ b) (\mathbb{Z}, \bullet)
c) (A, \bullet) d) (N, U)

II. Fill in the blanks**5 x 1 =5**

6. Determine the independent term of x^7 in the expansion of $(3x^2 + 4)^{12}$ is _____
7. An injection is a function which is _____
8. The number of elements in the adjacency matrix of a graph having 7 vertices is _____
9. Number of Trees on 4 vertices is _____
10. _____ relationships are referred to as R.

SECTION– B**5 x 2=10****Answer all the questions**

11. Write the recurrence relation for the Fibonacci sequence ..
12. What is the starling number of second kind?
13. Is K_5 a bipartite graph?
14. What are trees?
15. Define Poset.

SECTION– C**3 x10=30****Answer ANY THREE questions**

16. Explain derangements with an example.
17. Describe Inclusion-Exclusion principle.
18. Write a note on Isomorphic Graphs .

19. Consider a complete undirected graph with vertex set $\{0, 1, 2, 3, 4\}$. Entry W_{ij} in the matrix W below is the weight of the edge $\{i, j\}$. What is the minimum possible weight of a spanning tree T in this graph such that vertex 0 is a leaf node in the tree T ?

0	1	8	1	4
1	0	12	4	9
8	12	0	7	3
1	4	7	0	2
4	9	3	2	0

20. State and prove mobius inversion theorem .