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(FOR THE CANDIDATES ADMITTED DURING THE ACADEMIC YEAR 2021 ONLY)

21PMS314

REG.NO. :

N.G.M.COLLEGE (AUTONOMOUS) : POLLACHI

END-OF-SEMESTER EXAMINATIONS : DECEMBER-2022

COURSE NAME: M.Sc.- MATHEMATICS **MAXIMUM MARKS: 70**

SEMESTER: III **TIME : 3 HOURS**

GRAPH THEORY

SECTION - A (10 X 1 = 10 MARKS)

ANSWER THE FOLLOWING QUESTIONS.
MULTIPLE CHOICE QUESTIONS. K1

1. A tree with 10 vertices has_____.
   (a) 9 edges (b) 10 edges (c) 11 edges (d) none
2. The statement" The edges are not repeated in an Euler tour of any graph"_____.
   (a) Always true (b) Always false (c) Sometimes true (d) None
3. The number of perfect matching of a tree with 5 vertices is _____.
   (a) 2 (b) 0 or 1 (c) 4 (d) none
4. The chromatic number of a complete graph with 4 vertices is _____.
   (a) 4 (b) 3 (c) 2 (d) 0
5. A complete graph with 5 vertices is_____.
   (a) Planar graph (b) Non-planar graph (c) tree (d) N0ne

ANSWER THE FOLLOWING IN ONE OR TWO SENTENCES. K2

6 Define Simple graph with example.

7. What is an Euler Tour?
8. Define Independent set with example.
9. What is Chromatic Polynomial?
10. Write down the Euler formula.

SECTION – B (5 X 4 = 20 MARKS)

ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS. K3

11. a) Prove that the number of vertices of odd degree in any graph is always even

(OR)

b) Prove that a tree with n vertices has (n-1) edges

12. a) Prove that if G is 2-connected graph, then any two vertices of G lie on a common cycle.

(OR)

b) Explain Konigsberg bridge problem

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13. a) Prove that every k-regular bipartite graph has a perfect matching

(OR)

b) Prove that in any graph G, the sum of independent number of the graph G and covering number of the graph G is equal to its number of vertices.

14. a) Prove that if G is k-critical then $\delta \geq k-1$

(OR)

b) Prove that every critical graph is block

15.a) Prove that a complete graph with 5 vertices is non-planar.

(OR)

b) Prove the Euler formula for any connected graph G.

SECTION - C (4 X 10 = 40 MARKS)

ANSWER ANY FOUR OUT OF SIX QUESTIONS
(16th QUESTION IS COMPULSORY AND ANSWER ANY THREE QUESTIONS
(FROM Qn. No : 17 to 21) K4 & K5

16. State and prove the VIZING'S theorem.

17. Prove that a graph is bipartite if and only if it contains no odd cycles.

18. Prove that a non-empty connected graph is Eulerian if and only if it has no vertices of odd degree.

19. Prove that every 3-regular graph without cut edges has a perfect matching.

20. Prove that if G is simple graph with more than two vertices and $\delta \geq \gamma/2$ then G is Hamiltonian.

21. State and prove the Kuratowski's theorem.

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ETHICAL PAPER