Register No.: ……………………………… Name: ………………………………………………………….

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

FOURTH SEMESTERB.TECH DEGREE EXAMINATION (Regular), JULY 2022
COMPUTER SCIENCE AND ENGINEERING
(2020 SCHEME)

Course Code: **20MAT206**

Course Name: **Graph Theory**

Max. Marks: **100** **Duration: 3 Hours**

PART A

(Answer all questions. Each question carries 3 marks)

1. Define Complete Graph. Draw a complete graph with 5 vertices.
2. Prove that it is impossible to have a group of nine people at a party such that each one knows exactly five of the others in the group.
3. Define Hamiltonian Graph. Give an example of a graph that has a Hamiltonian path but does not have Hamiltonian circuit.
4. Distinguish between reflexive digraph and transitive digraph.
5. Draw all labelled Tree with 3 vertices.
6. Define Spanning tree with example.
7. Define cut vertex of a graph. Draw a graph having 2 cut vertices
8. Define Planar graph with an example.
9. Define path matrix of a graph.
10. Define Chromatic number.

PART B

(Answer one full question from each module, each question carries 14 marks)

MODULE I

11. a) Define Walk, path and circuit in graph with help of an example. (6)

    b) Show that the number of odd degree vertices in a graph is always even. (8)

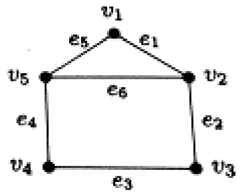
OR

12. a) If a graph has exactly two vertices of vertices of odd degree, then prove that there must be a path joining these two vertices. (6)

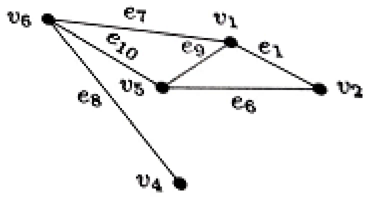
    b) Prove that a simple graph with 'n' vertices and k components can have atmost $\frac{(n-k)(n-k+1)}{2}$ edges. (8)

MODULE II

13. a) Find the union, intersection and Ring sum of the following graphs. (6)



(a) *G*



(b) *H*

b) Prove that a connected graph is Euler if and only if all vertices are of even degree. (8)

OR

14. a) Find the possible number of Hamiltonian circuits in a complete graph with 'n' vertices, if 'n' is odd. Explain (6)

b) Explain Travelling Salesman problem. (8)

MODULE III

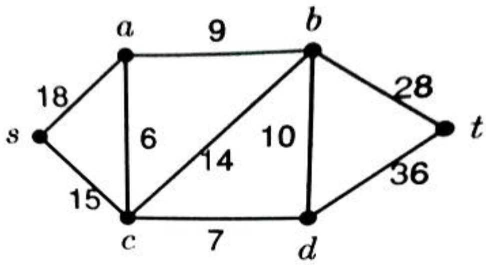
15. a) Draw a Spanning tree T of K_5 . Write the set of chords and branches of T. (6)

b) Prove or disprove : A tree with n vertices has n-1 edges (8)

OR

16. a) Prove that in a Binary tree with 'n' vertices, the number of pendent vertices is p $= \frac{(n+1)}{2}$ (6)

b) Using Dijkstra's algorithm, Find the minimum spanning tree of the following graph. (8)



MODULE IV

17. a) Prove that a connected planar graph with n vertices and e edges has $e-n+2$ regions (6)

b) Show that $K_{3,3}$ is non -planar (8)

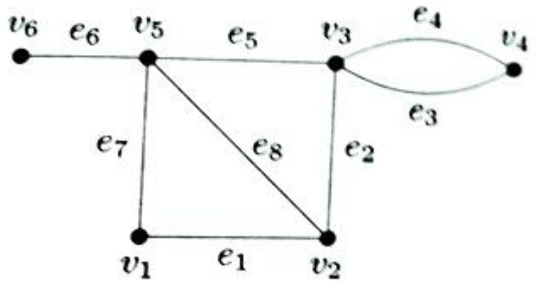
OR

18. a) Define vertex connectivity and edge connectivity. Show that the edge connectivity of a graph cannot exceed the edge connectivity . (6)

b) Show that a complete graph with 5 vertices is non-planar (8)

MODULE V

19. a) Define incidence matrix of a graph. Find the incidence matrix of the following graph (6)

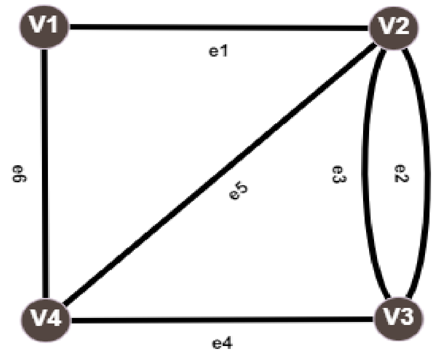


b) Prove that every planar graph is 5- colorable. (8)

OR

20. a) Explain four color problem using the concept of chromatic number. (6)

b) List the cycles and obtain the cycle matrix of the following graph. (8)



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