Reg. No. : ....

Name : ....

VI Semester B.Sc. Degree (C.B.C.S.S. – OBE – Regular/Supplementary/ Improvement) Examination, April 2024
(2019 to 2021 Admissions)
DISCIPLINE SPECIFIC ELECTIVE IN MATHEMATICS
6B14A MAT : Graph Theory

Time : 3 Hours

Max. Marks : 48

PART – A

Answer **any 4** questions. **Each** question carries **one** mark.

1. Define a simple graph.

2. Define a vertex deleted subgraph.

3. Define the adjacency matrix of a graph.

4. Define the vertex connectivity of a graph.

5. State Kuratowski's theorem.

PART – B

Answer **any 8** questions. **Each** question carries **two** marks.

6. Draw all non isomorphic simple graphs with 3 vertices.

7. By considering two graphs G_1 and G_2 on three vertices, draw $G_1 \cap G_2$ and $G_1 \cup G_2$.

8. Define a self complementary graph. Draw a graph which is self complementary.

9. For a connected graph G, define the terms diameter and eccentricity.

10. Define a tree and sketch two isomorphic trees on 4 vertices.

11. Draw Petersen graph and determine the vertex connectivity of the Petersen graph.

12. Define a tour and an Euler tour of a graph G.

P.T.O.

13. Define Hamiltonian graph. Draw a graph with Hamiltonian path but no Hamiltonian cycle.

14. Explain the travelling salesman problem.

15. State Jordan curve theorem and give an example of a complete graph which is nonplanar.

16. Verify Euler's formula for wheel graph W_4.

PART – C

Answer **any 4** questions. **Each** question carries **four** marks.

17. State and prove the first theorem of graph theory.

18. Let G be an acyclic graph with n vertices and k connected components. Then prove that G has n-k edges.

19. Prove that a connected graph with n vertices and n-1 edges is a tree.

20. Define closure of a graph with example.

21. Prove that a simple graph G is Hamiltonian if and only if its closure C(G) is Hamiltonian.

22. Show that $K_{3, 3}$ is nonplanar.

23. Explain contraction with example.

PART – D

Answer **any 2** questions. **Each** question carries **six** marks.

24. Define a complete graph and complete bipartite graph. Give an example of a complete bipartite graph which is complete. Also sketch the complete graphs with at most 6 vertices.

25. Prove that a graph G is connected if and only if it has a spanning tree.

26. Prove that a connected graph G is Euler if and only if the degree of every vertex is even.

27. Let G be a simple 3 connected graph with at least 5 vertices. Then prove that G has a contractible edge.

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