

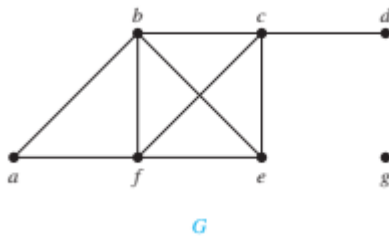
B.Sc DEGREE END SEMESTER EXAMINATION- MARCH 2026**SEMESTER 6 : COMPUTER APPLICATION****COURSE : 19U6CRCMT07 - GRAPH THEORY AND NUMERICAL ANALYSIS***(For Regular - 2023 Admission and Supplementary 2022/2021/2020/2019 Admissions)*

Time : Three Hours

Max. Marks: 75

PART A**Answer any 10 (2 marks each)**

1. Draw a graph which is Hamiltonian but not Eulerian.
2. Let G be a connected graph. If G has 21 vertices, what is the minimum possible number of edges in G ?
3. Is a maximum matching a perfect matching? Justify.
4. Solve the system of linear equations $2x - 6y + 8z = 24$; $5x + 4y - 3z = 2$; $3x + y + 2z = 16$ using Gauss elimination method.
5. Find a root of the equation $x^3 - 4x - 9 = 0$, correct to 2 decimals using bisection method.
6. Let G be Hamiltonian graph. Then show that G does not have a cut vertex.
7. Find graphically the real root of the equation $x^3 + x - 1 = 0$.
8. Using Crout's method, solve $x + y + z = 6$; $2x + 5y + 2z = 18$; $2x + 3y + 4z = 20$
9. Can a simple graph exist with 15 vertices each of degree 5
10. Define a regular graph with example.
11. Explain the Konigsberg bridge problem.
12. Verify First theorem of graph theory for the following graph G .

**(2 x 10 = 20)****PART B****Answer any 5 (5 marks each)**

13. Let G be a graph with n vertices, q edges and $\omega(G)$ connected components. Then prove that G has at least $n - \omega(G)$ edges, i.e., $q \geq n - \omega(G)$.
14. Find a root of the equation $x = e^{-x}$ correct to 3 decimals using Newton Raphson's method.
15. Solve the system of linear equations $2x + y + z = 10$; $3x + 2y + 3z = 18$; $x + 4y + 9z = 16$ using Gauss Jordan method.
16. Prove that an edge e in a graph G is a bridge if and only if e is not part of any cycle in G .
17. If G is a graph in which degree of every vertex is atleast two, then prove that G contains a cycle.
18. What are the elementary row operations used in Gauss Jordan Method?

19. Find a root of the equation $x = \cos x$ correct to three decimal places using regula falsi method.
20. Prove that a connected graph G has an Euler trail if and only if it has at most two odd vertices.

(5 x 5 = 25)

PART C

Answer any 3 (10 marks each)

21. Using Gauss-Seidel iteration method, solve the system of equations
 $8x - 3y + 2z = 20$; $4x - 11y - z = 33$; $6x + 3y + 12z = 35$.
22. Prove that if G is a non-empty graph with atleast two vertices then G is bipartite iff G has no odd cycles.
23. State and prove Dirac's theorem for Hamiltonian graphs.
24. Apply Graeffe's root squaring method to solve the equation $x^3 - 8x^2 + 17x - 10 = 0$.

(10 x 3 = 30)