Name **25U646**

Reg. No ....

B.Sc. DEGREE END SEMESTER EXAMINATION - MARCH 2025

SEMESTER 6 : COMPUTER APPLICATION

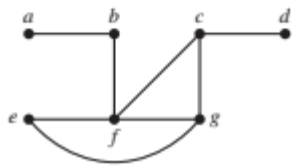
COURSE : **19U6CRCMT07 - GRAPH THEORY AND NUMERICAL ANALYSIS**

(For Regular 2022 Admission and Supplementary 2021/2020/2019 Admissions)

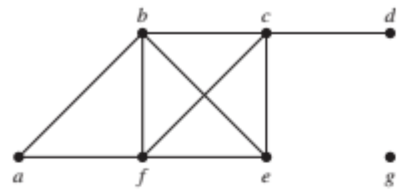
Time : Three Hours Max. Marks: 75

PART A
Answer any 10 (2 marks each)

1. Find graphically the real root of the equation $x^3 + x - 1 = 0$.
2. Solve the system of linear equations x + 2y - z = 3 ; 3x - y + 2z = 1 ; 2x - 2y + 3z = 2 using Gauss elimination method.
3. Find two spanning trees for the following graph



4. Draw a graph which has an Euler trail but not Eulerian.
5. Verify First theorem of graph theory for the following graph G.



G

6. 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.
7. Define M-augmenting path with an example.
8. If a graph contains 21 edges, 3 vertices of degree 4 and the other vertices of degree 3 , then find the number of vertices?
9. Find the Newton- Raphson formula for the equation $x^3 – 2x – 5 = 0$.
10. Define closure of a simple graph G.
11. Draw two maximum matchings which are not perfect.
12. Explain Gauss-Seidel iteration method.

(2 x 10 = 20)

PART B
Answer any 5 (5 marks each)

13. Solve the system of linear equations x + 2y + z = 8 ; 2x + 3y + 4z = 20 ; 4x + 3y + 2z = 16 using Crout's method.
14. If for each pair of distinct vertices u and v of a simple graph G, there are two internally disjoint u-v paths in G,then prove that G is 2-connected.

15. Solve the system of linear equations $2x - 6y + 8z = 24$; $5x + 4y - 3z = 2$; $3x + y + 2z = 16$ using Gauss Jordan method.

16. Find a root of the equation $x^3 - 3x^2 + 7x - 8 = 0$ correct to 3 decimals using Newton Raphson's method.

17. Find an approximate value of the root of the equation $x^3 + x - 1 = 0$ near $x = 1$, using the method of false position.

18. Prove that any tree T with atleast two vertices have more than one vertex of degree 1.

19. Let G be a simple graph with n vertices, $n \geq 3$. If closure C(G) of G is complete,then prove that G is Hamiltonian.

20. State and Prove Bondy-Chvatal Theorem.

(5 x 5 = 25)

PART C

Answer any 3 (10 marks each)

21. Using Gauss-Seidel iteration method, solve the system of equations
$10x - 2y - z - w = 3$; $-2x + 10y - z - w = 15$; $-x - y + 10z - 2w = 27$; $-x - y - 2z + 10w = -9$.

22. Let G be a simple graph with n vertices and let u and v be two non-adjacent vertices in G such that $d(u) + d(v) \geq n$. Then prove that G is Hamiltonian if and only if G + uv is Hamiltonian.

23. a) 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.
b) If T is a tree with n vertices then it has precisely n-1 edges.

24. Find all roots of the equation $x^3 - 6x^2 + 11x - 6 = 0$ by Graeffe's method squaring thrice.

(10 x 3 = 30)