

# ABV- Indian Institute of Information Technology & Management, Gwalior

## IT209: Graph Theory

Major Examination (Session 2024–25)

Maximum Time: 3 Hours

Max Marks: 45

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**Note: Attempt all questions. Neat diagrams will fetch you additional marks.**

1. (a) Define graph isomorphism with an example. (b) Show that the graphs given (provide figure) are/are not isomorphic. (8 Marks)
2. (a) State and prove Euler's formula for planar graphs. (b) Use it to verify planarity of a cube graph. (8 Marks)
3. (a) Explain Breadth First Search (BFS) and Depth First Search (DFS). (b) Apply BFS to the given graph (diagram to be provided). (8 Marks)
4. (a) Define chromatic number. (b) Find the chromatic number of  $C_4$ ,  $C_5$ , and  $K_4$ . (7 Marks)
5. (a) Explain Dijkstra's Algorithm for shortest path with an example. (b) Apply it to a weighted graph. (7 Marks)
6. Write short notes on any two: (i) Hamiltonian Graphs (ii) Applications of Graph Coloring (iii) Minimum Spanning Trees. (7 Marks)