

GRAPH THEORY

Time: 2 Hrs

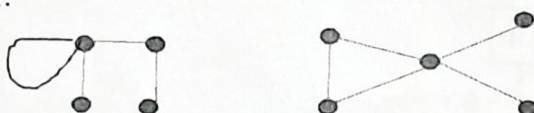
Max marks: 35

Instructions for candidates:

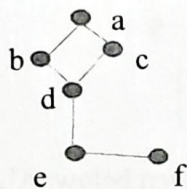
1. All questions are compulsory.
2. Figures to right indicate full marks.
3. Non-programmable, single memory scientific calculator is allowed.

Q1. Attempt any FIVE in the following-**[10 M]**

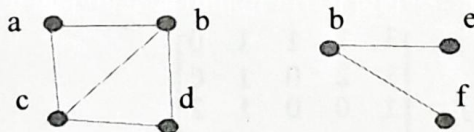
- ✓ a) Check whether each of the given graphs, G_1 , G_2 , is a simple graph. Justify your answer.

 G_1 G_2

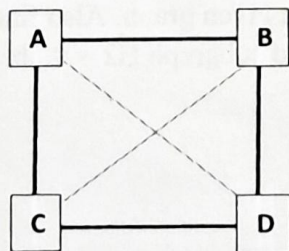
- ✓ b) Draw a spanning tree of the following graph.



- ✓ c) Find the union and intersection of given graphs, G_1 , G_2 .

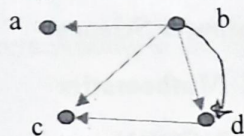
 G_1 G_2

- ✓ d) Write any two paths of length 2 in the following graph from vertex A to D.



e) Let G be a connected graph with degree sequence $2, 2, 2, 2, 3, 3$. Is G an Eulerian graph? Justify.

f) Find indegree of every vertex in the given graph.

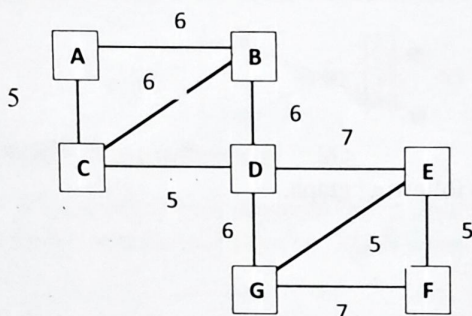


g) Does there exist a complete binary tree with 224 vertices? Justify.

Q2. Attempt any THREE in the following.

[15 M]

- Draw all non-isomorphic trees on n vertices. $n = 5, 6$.
- Give an example of each of the following:
 - A graph which is Eulerian but not Hamiltonian.
 - A graph which neither Eulerian nor Hamiltonian.
- Is it possible to construct a graph on 7 vertices and 18 edges with edge connectivity 5? Justify. If yes, draw the graph.
- Find a minimal spanning tree of the following graph using Kruskal's algorithm.



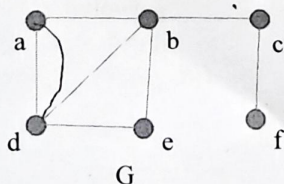
e) Draw a graph represented by adjacency matrix given below. Also, write its incidence matrix.

$$A(G) = \begin{bmatrix} 1 & 1 & 1 & 1 & 0 \\ 1 & 2 & 0 & 1 & 0 \\ 1 & 0 & 0 & 1 & 2 \\ 1 & 1 & 1 & 1 & 3 \\ 0 & 0 & 2 & 3 & 2 \end{bmatrix}$$

Q3. Attempt any ONE in the following-

[10 M]

- Find all the bridges and cutvertices of the given graph. Also find vertex induced subgraph $H_1 = \langle a, b, d, f \rangle$ and edge induced subgraph $H_2 = \langle ab, be, de, bc, cf \rangle$ of G .



b) Using Dijkstra's algorithm find a shortest path from the vertex A to all other vertices.

