

Anekant Education Society's

Tuljaram Chaturchand College, Baramati

Department of Mathematics

Class:F.Y.B.Sc. Computer Science

Question Bank

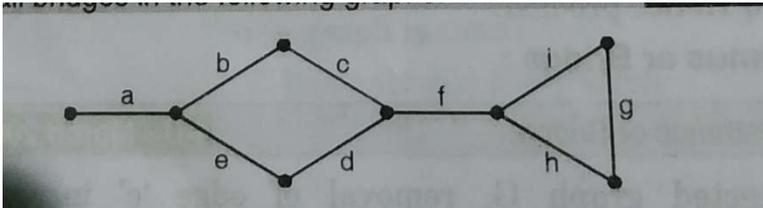
Title of Paper :Graph Theory

Sub Code:CSMT1101

Answer in One Sentence(or in 2 – 3 lines)

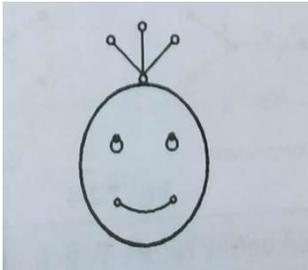
(2 marks questions)

1. Define graph.
2. Write a statement of Handshaking lemma.
3. Define complete graph.
4. Define complete bipartite graph.
5. Is every complete bipartite graph a complete graph.
6. Define regular graph.
7. Draw the bipartite graph which is not regular.
8. Draw 3-regular graph on 6 vertices.
9. Draw the complete bipartite graph on 6 vertices.
10. Draw all possible graph with 3 vertices.
11. How many edges are there in a graph with 10 vertices each of degree 6.
12. Does every regular graph complete? Justify.
13. Find number of edges in $K_{5,8}$ graph.
14. Draw following graphs $K_5, K_{3,4}$.
15. Define tree.
16. Draw all possible non-isomorphic trees with 4 vertices.
17. Define bridge.
18. Find all bridges of the following graph.

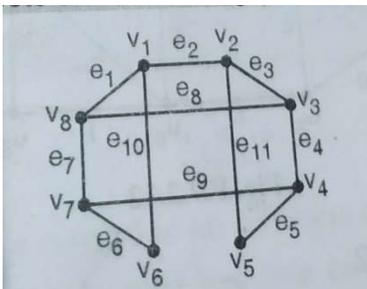


19. Define cut vertex and cut edges.
20. Define weighted spanning tree.
21. Define Eulerian graph.
22. Define Hamiltonian graph.

23. Define directed graph.
24. Define pendant vertex and simple diagraph.
25. Define complete symmetric diagraph.
26. State true or false with justification:
 “A binary tree with n vertices has $\binom{n-1}{2}$ non-pendant vertices”.
27. Define binary tree.
28. Does there exist a binary tree with 6162 vertices? Justify?
29. Find the number of components in the following graph.



30. Determine true or false: “If G is connected graph then \bar{G} is disconnected”.
31. Is every disconnected graph has an isolated vertex.
32. Define connected graph.
33. Find any two cut sets of the following graph.

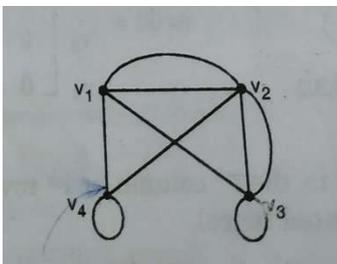


34. Define Edge connectivity and Vertex connectivity.
35. Draw graph $K_{4,3}$ and find it's vertex connectivity and edge connectivity.

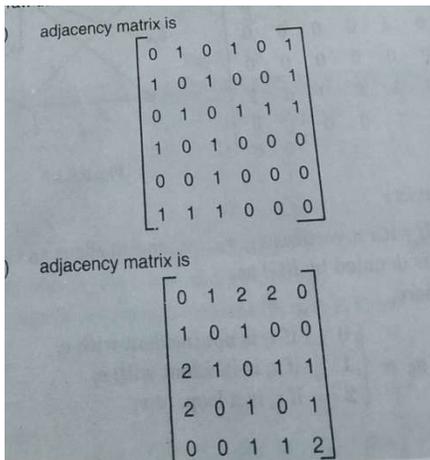
Short Answer Questions

(4 marks questions)

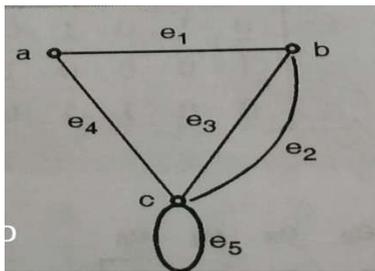
1. Find adjacency matrix of the following graph.



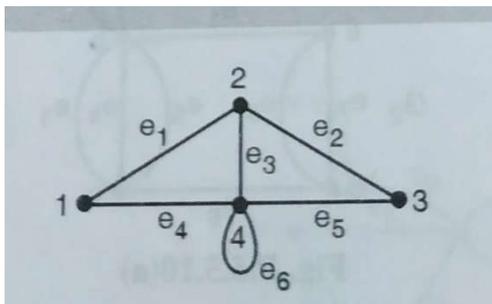
2. Draw the following graph whose adjacency matrix is-



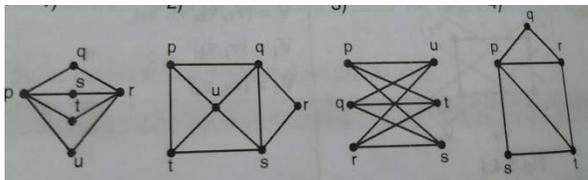
3. Write Incidence and adjacency matrix of the following graph.



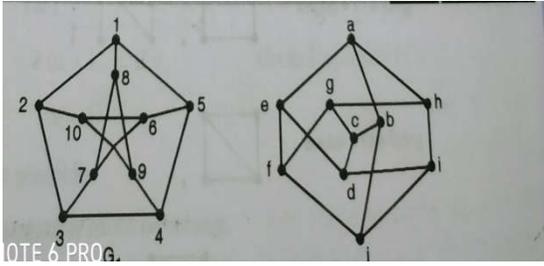
4. Write adjacency matrix and incidence matrix of the following graph.



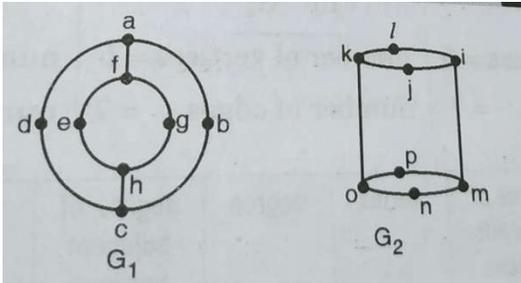
5. Determine which of the following graph are bipartite.



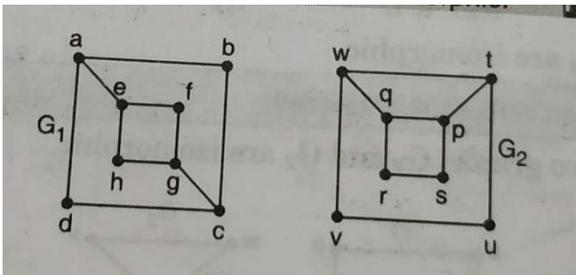
6. Define isomorphic graphs. Determine whether given graph G1 and G2 be isomorphic.



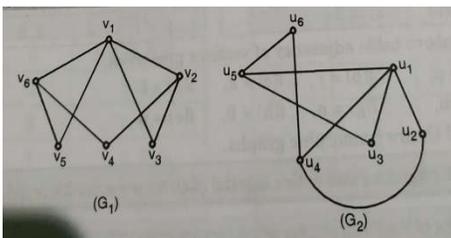
7. Show that G_1 and G_2 are isomorphic.



8. Determine if the following graphs are isomorphic.

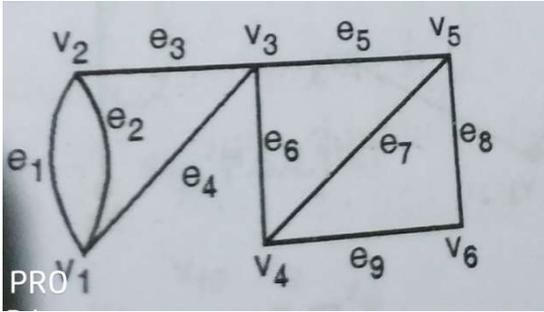


9. Show that the following graphs are isomorphic.



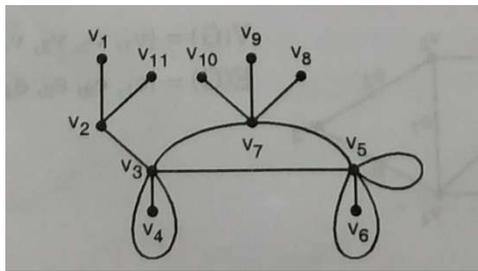
10. Consider the given graph G .

- Find induced subgraph $G[V]$ where $V = \{v_1, v_2, v_5, v_6\}$
- Find $G - A$ where $A = \{e_1, e_2, e_8, e_9\}$

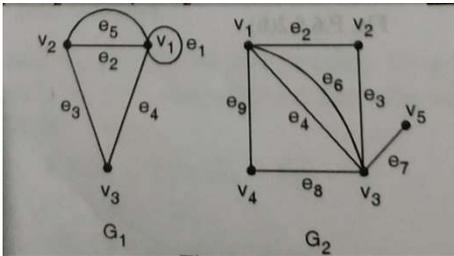


11. For the graph G given below, draw the following subgraph.

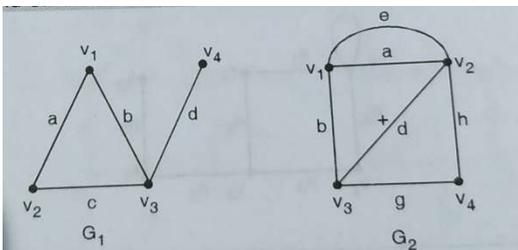
a. $G - \{v3, v7\}$



12. Find Union and Intersection of the following graph.

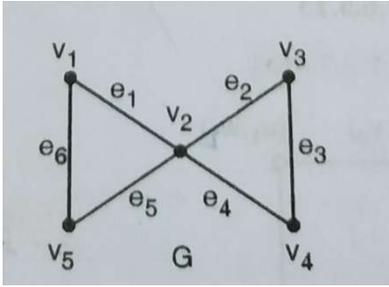


13. Consider the graph G1 and G2. Find $G1 \cup G2$ and $G1 \cap G2$.

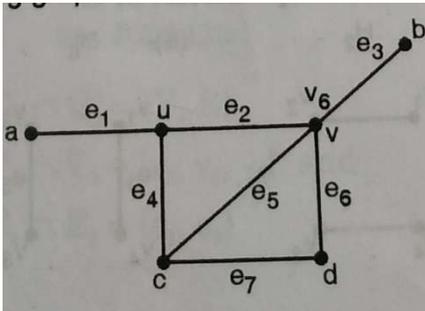


14. Consider the graph G. Find –

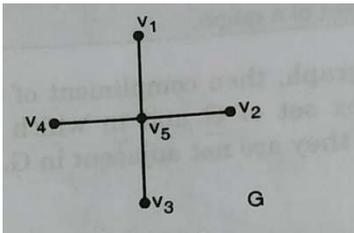
- Fusion of $v1, v3$.
- Fusion of $v1, v2$.



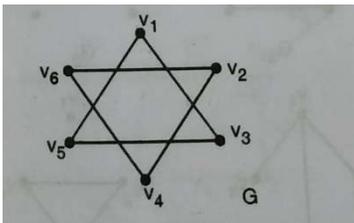
15. For the following graph G. Draw the graph after fusion of u and v.



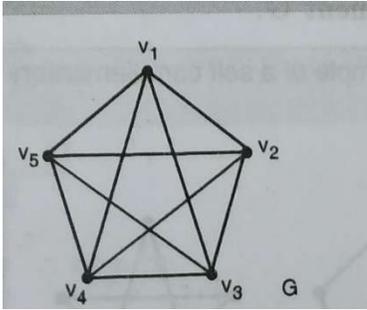
16. Draw the complement of graph G.



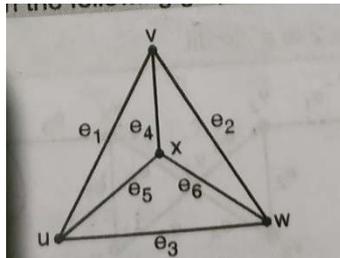
17. Draw the complement of graph G.



18. Is the following graph a complete graph? If so, draw its complement.



19. Find all u-v path in the following graph.



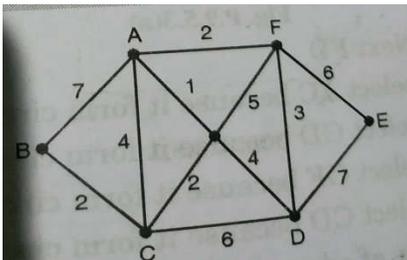
20. If G is any graph, every u-v walk contains a u-v path.

21. If T is a tree on n vertices then prove that T has $(n-1)$ edges.

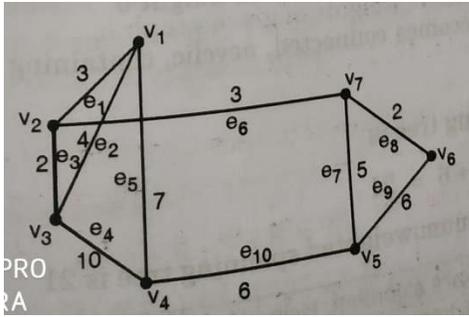
22. Let T is a graph on p vertices and q edges. If T is acyclic and $q=p-1$ then T is connected and $q=p-1$.

23. Let T is a graph on p vertices and q edges. If T is connected and $p=q-1$ then T is connected and every edge is an bridge.

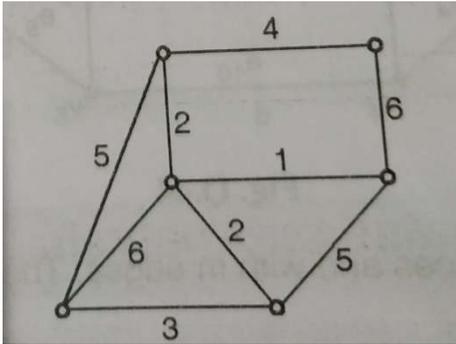
24. Using Kruskal's Algorithm find the minimum weighted spanning tree in the following graph.



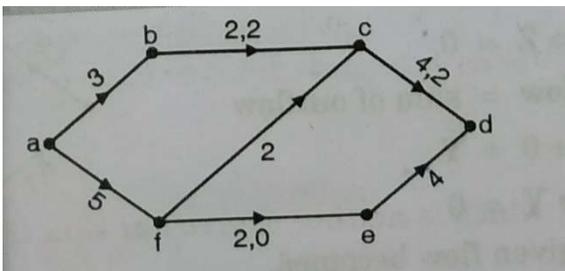
25. Using Kruskal's Algorithm find minimum weighted spanning tree in the following graph.



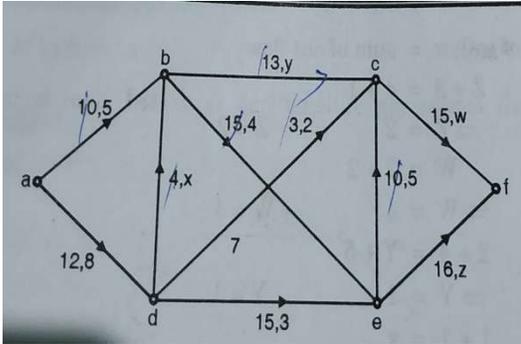
26. Find maximum and minimum height of binary tree with 13 vertices. Draw such a tree.
27. A tree has 2 vertices of degree 2, 1 vertex of degree 3 and 3 vertices of degree 4. Find no. of vertices of degree 1 in the tree.
28. Using Kruskal's Algorithm find shortest spanning tree in the following graph also find weight of the shortest spanning tree.



29. Write definition of flow in a network.
30. In the following network fill the missing figures, so that the result is a flow in the given network, find also the value of the flow.



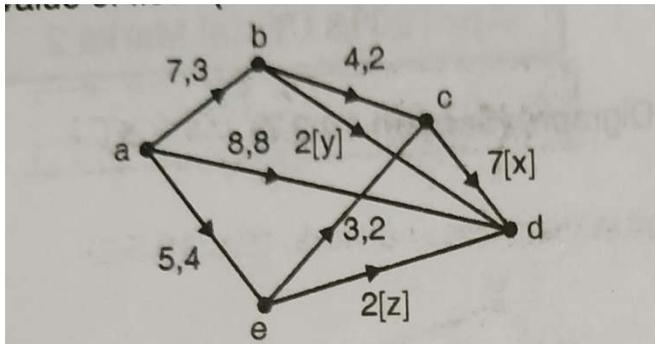
31. Find the value of x, y, z, w in the following network.



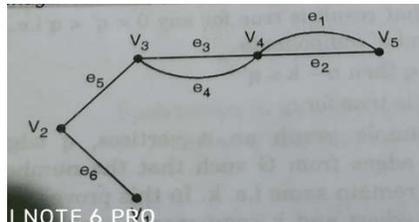
32. Define the following terms.

- a. Sink in a network
- b. Source in a network
- c. Flow in a network
- d. Capacity of an edge.

33. In the following network, determine missing figures so that the result is a flow in given network. Also find value of flow.



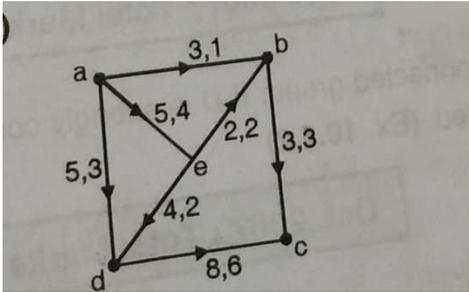
34. Find all bridges of the following graph.



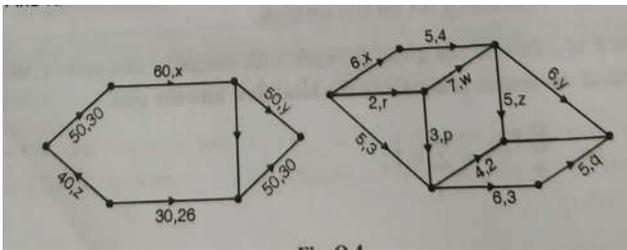
Long Answer Questions

(8 marks questions)

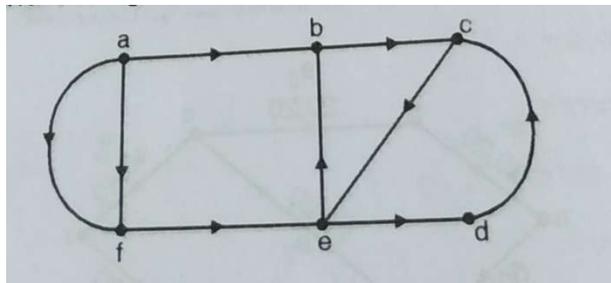
- In the following network the first number along each edge is the capacity of the edge .decide whether the second set of numbers along the edge is a flow for the network .If not state why.



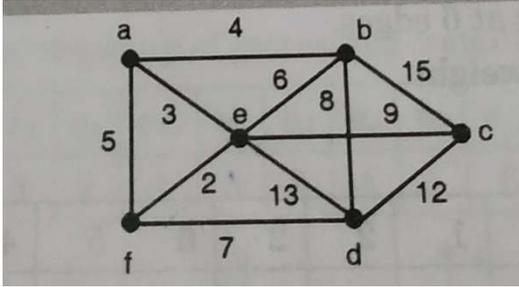
- Find values of variables in the various networks.



- Find indegree and outdegree of each vertex in the digraph given below.



- Let T be a graph on n vertices and with m edges. Then prove that following statements are equivalent.
 - T is tree
 - T has no cycle and $m=n-1$
- Use Kruskal's algorithm to find a minimum spanning tree of the following weighted graph.



6. Define Directed graph and explain the following terms with example.

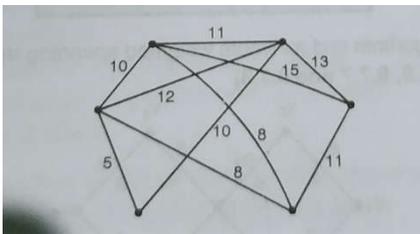
- a. Simple diagram
- b. Simple Symmetric diagram
- c. Asymmetric
- d. Symmetric

7. Define the following terms with proper example.

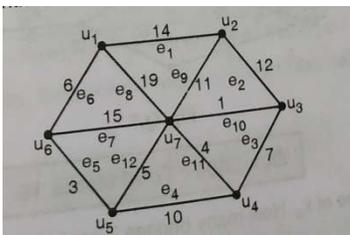
- a. Edge Induced Sub graph
- b. Vertex Induced Sub graph
- c. Edge disjoint subgraph
- d. Vertex disjoint sub graph

8. If u and v are any two distinct vertices of T , then prove that there exist exactly one path between u and v .

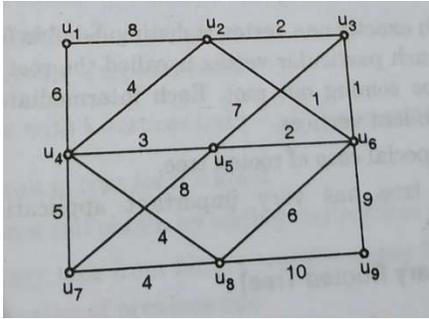
9. Write Kruskal's algorithm to find spanning tree with minimum weight using Kruskal's algorithms to find spanning tree with minimum weight of given graph G .



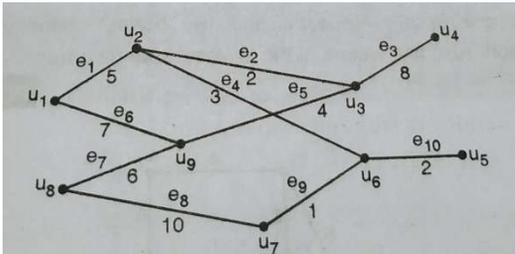
10. Using Kruskal's algorithms find the minimum weighted spanning tree in the following graph



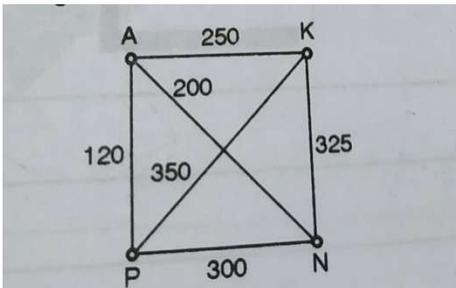
11. Using Kruskal's algorithms to find a minimum spanning tree of the following weighted graph.



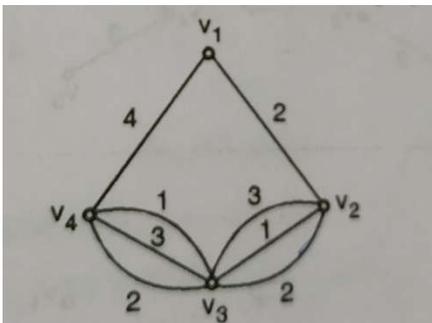
12. Write Kruskal's algorithm. Using algorithm find minimum spanning tree of the following graph.



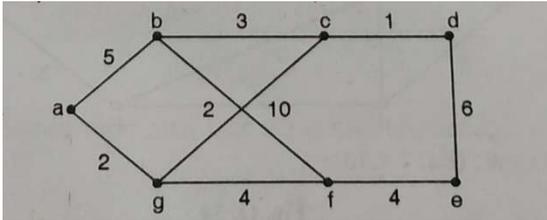
13. Solve the travelling salesman problem for the following graph.



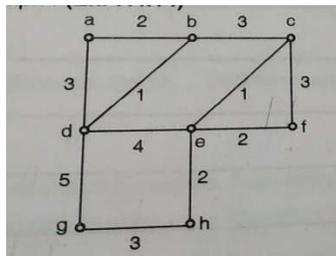
14. Solve the Chinese postman problem for the graph given below.



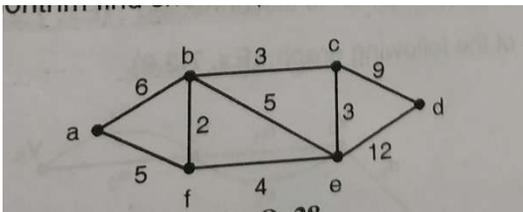
15. Use Dijkstra's algorithm to find a shortest path from vertex a to all vertices of the graph given below.



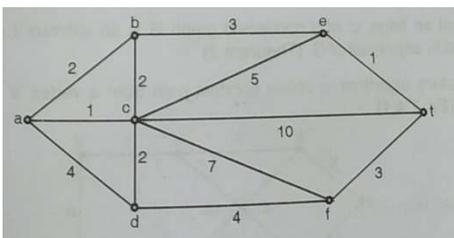
16. Use Dijkstra's algorithm to find a shortest path from vertex 'a' to vertex 'h' in the following weighted graph.



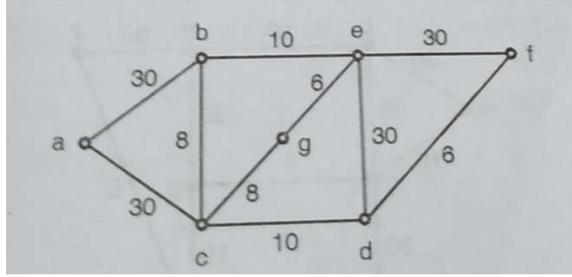
17. Use Dijkstra's algorithm to find a shortest path from vertex 'a' to 'f' in the following graph



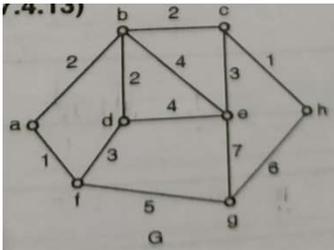
18. Use Dijkstra's algorithm to find a shortest path from vertex 'a' to the vertex 't' in the following graph.



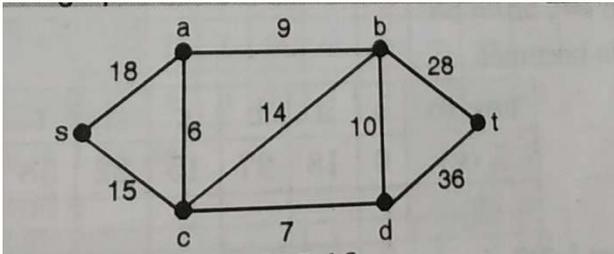
19. Use Dijkstra's algorithm to find a shortest path from vertex 'a' to vertex 'f' in the following graph.



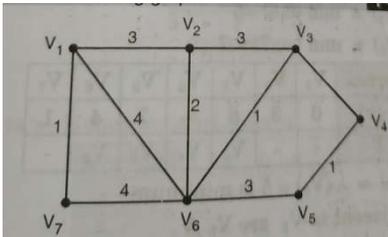
20. Use Dijkstra's algorithm to find a shortest path from vertex 'a' to all vertices in the following graph.



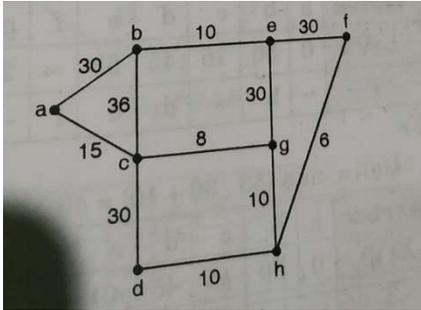
21. Use Dijkstra's algorithm to find a shortest path from vertex 's' to all other vertices in the following graph.



22. Use Dijkstra's algorithm to find a shortest path from vertex 'V1' to every other vertex of the following graph.



23. Use Dijkstra's algorithm to find a shortest path from vertex 'a' to 'f' in the following graph.



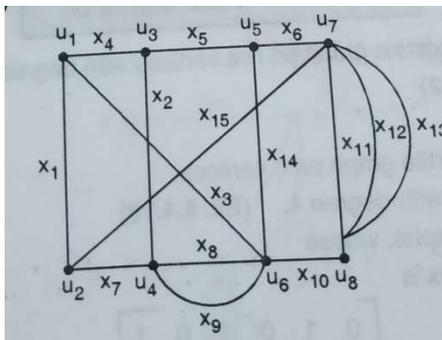
24. Judge whether the following statements are true or false. Justify.

- Every subgraph of connected graph is connected.
- If a graph G has bridge then it has cut vertex.
- Vertex connectivity of cycle is 3.
- A bipartite graph is always connected graph.

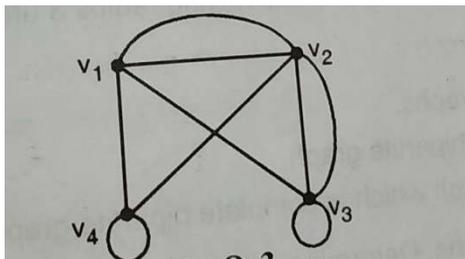
25. Draw any four non-isomorphic spanning sub graph of the graph K_4 .

26. Find all sub graphs of the following graph G having atleast one vertex.

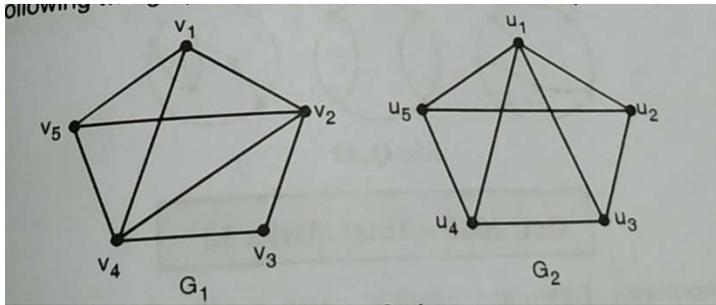
27. Find the adjacency matrix of the following graph.



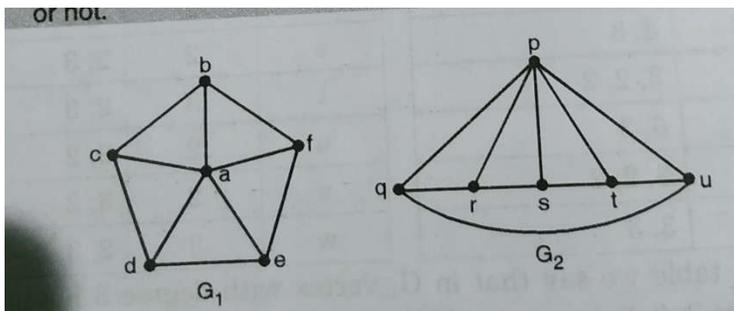
28. a. Find adjacency matrix of the following graph.



b. Are the following two graphs are isomorphic?



29. Define isomorphism and determine whether following graphs are isomorphic or not?



30. Write Prim's algorithms.

31. Write Breadth First Search Algorithm.