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FIRST YEAR (Data Science)
24-DSC 12103: Introduction to Graph Theory
(Semester II)

Program: BSc (BSc DS10)
Program Specific: BSc (Data Science)
Course Type: Major
Paper: II

Credits: 2
Time: 2 Hours
Max. Marks: 30
SET: A

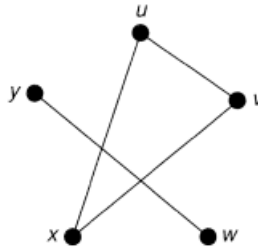
Instructions to the candidate:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Draw a well labelled diagram wherever necessary.

Q.1) Attempt ANY FIVE of the following:

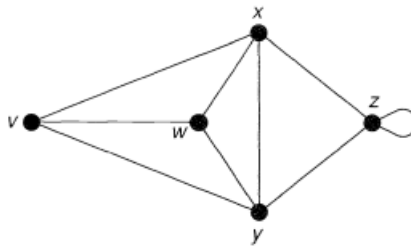
5 × 2 = 10

1) Find Complement of the following graph:



2) Draw the graph $K_{3,3}$. State whether this graph is a regular graph.

3) Verify Handshaking Lemma for the following graph



4) Is the degree sequence 4, 3, 2, 1, 1 graphical? Justify.

5) Find maximum height of binary tree with 11 vertices, draw such tree.

6) Define the following terms with one example

- i) Pendant vertex
- ii) Isolated vertex

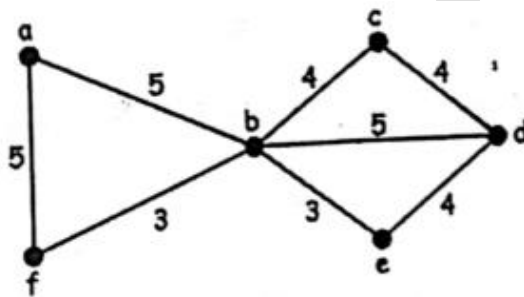
7) Draw the graph whose adjacency matrix is the following:

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

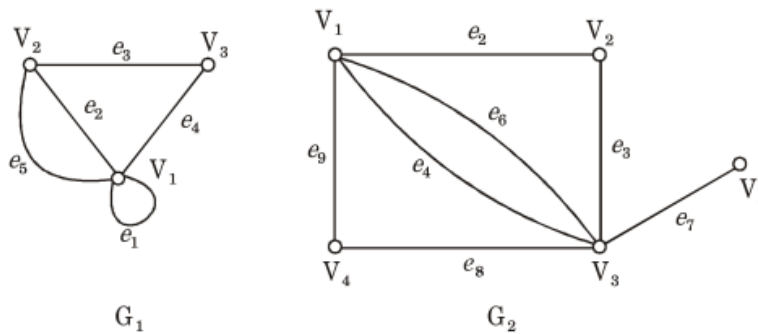
Q.2) Attempt ANY THREE of the following:

3 × 4 = 12

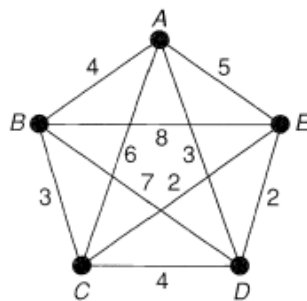
1) Use Kruskal's algorithm to find the shortest spanning tree of the following graph. Also find weight of the shortest spanning tree:



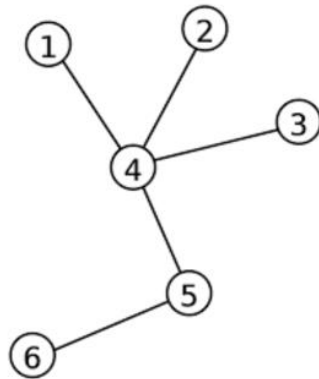
2) Find $G_1 \oplus G_2$ and $G_1 \cap G_2$ for the following graphs G_1 and G_2 :



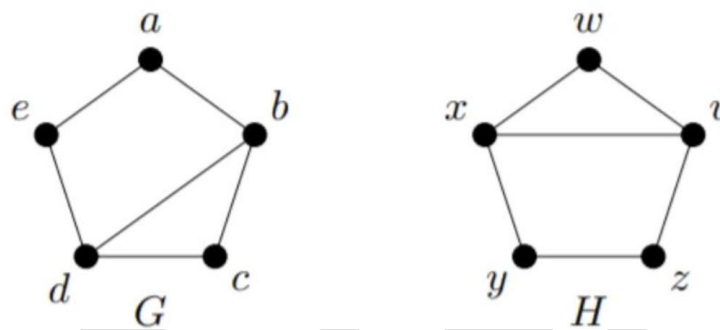
3) Solve the following Travelling Salesman problem:



4) Find centre, radius and Diameter of the following Tree:



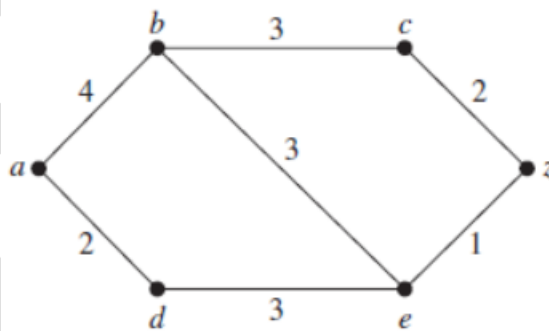
5) Are the following two graphs isomorphic? Justify.



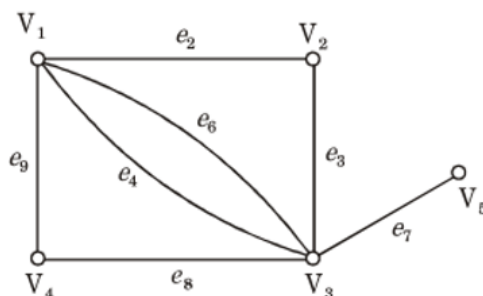
Q.3) Attempt ANY ONE of the following:

1 × 8 = 8

1) Use Dijkstra's algorithm to find the shortest path from vertex 'a' to 'z' in the following graph:



2) a) For the following graph G, find i) $G - \{V_1, V_4\}$ ii) $G - \{e_7, e_4, e_6\}$



b) In which order does an inorder traversal visit the vertices of the following ordered rooted tree T?

