


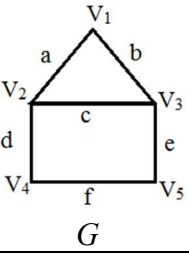
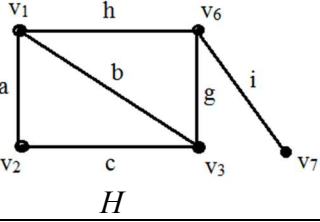
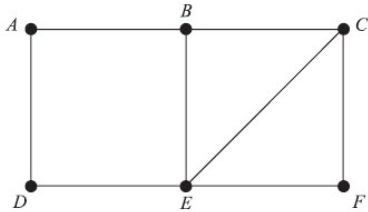
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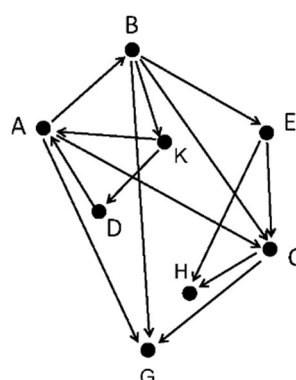
UPES
End Semester Examination, May 2024

Course: Graph Theory Program: B.Sc (Hons.) Mathematics Course Code: MATH 2025K	Semester: IV Time: 03 hrs. Max. Marks: 100
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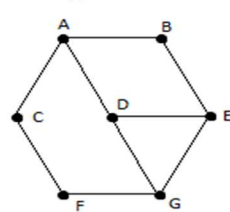
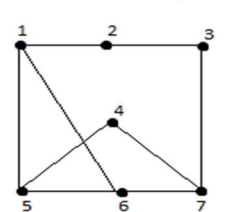
Instructions: All questions are compulsory

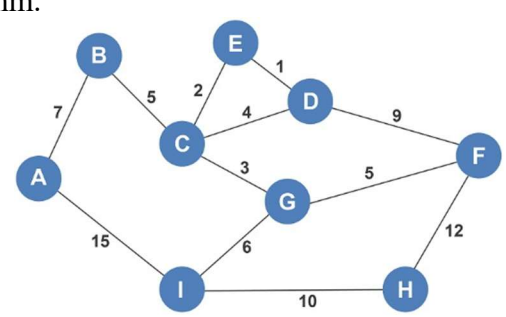
SECTION A
(5Qx4M=20Marks)

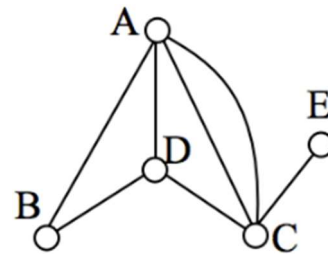
S. No.		Marks	CO
Q 1	Define the operations ‘union’, and ‘intersection’ of graphs. Draw the graphs $G \cup H$ and $G \cap H$ where G and H are given below: <div style="display: flex; justify-content: space-around; align-items: center; margin-top: 10px;"> <div style="text-align: center;">  <p>G</p> </div> <div style="text-align: center;">  <p>H</p> </div> </div>	4	CO1
Q 2	(a) Define the chromatic number of the graph. (b) What is the chromatic number of a cyclic graph? (c) What is the chromatic number of a complete graph? (d) What is the chromatic number of a bipartite graph?	4	CO1
Q 3	Define incidence matrix and draw a digraph from the following incidence matrix. $A = \begin{bmatrix} 1 & 1 & 0 & 0 & 0 & 0 & 0 & -1 \\ -1 & 0 & 1 & 0 & 0 & 0 & 0 & 1 \\ 0 & -1 & -1 & -1 & 1 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & 0 & 0 & -1 & 1 & 0 \\ 0 & 0 & 0 & 0 & -1 & 0 & 0 & 0 \end{bmatrix}$	4	CO1
Q 4	Consider the following graph: <div style="text-align: center; margin-top: 10px;">  </div> <p>Discuss whether this graph has any cut vertices, by obtaining all the subgraphs when each vertex is deleted.</p>	4	CO1

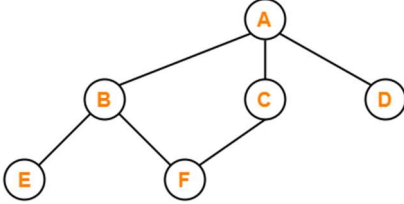
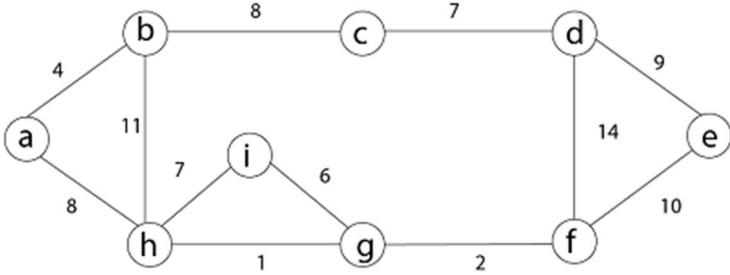
Q 5	Find the in-degree and out-degree of all the vertices in the following graph: 	4	CO1
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SECTION B
(4Qx10M= 40 Marks)

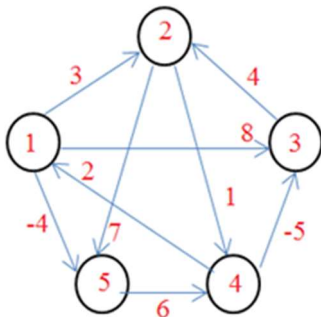
Q 6	Define Isomorphism of graphs and check whether the following graphs G and H given below are isomorphic or not by means of a function $f: V(P) \rightarrow V(Q)$. <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>P</p> </div> <div style="text-align: center;">  <p>Q</p> </div> </div>	10	CO1
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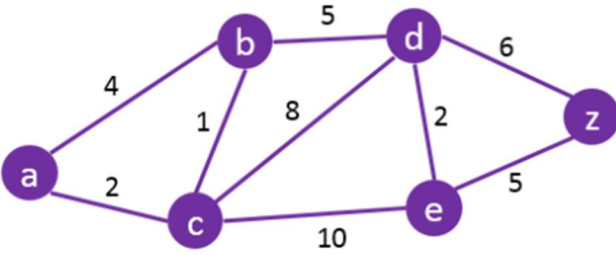
Q 7	Define Spanning tree and find the minimal spanning tree of the following graph using Prim's algorithm. 	10	CO3
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Q 8	Define Euler path and Euler circuit and find them in the following graph. 	10	CO2
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Q 9	<p>Apply the Breadth first search method to find the shortest path in the following graph.</p>  <p style="text-align: center;">OR</p> <p>Using Kruskal's algorithm, find the minimal spanning tree in the following graph.</p> 	10	CO3
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SECTION-C
(2Qx20M=40 Marks)

Q 10	<p>Explain the working of Floyd Warshall algorithm. Applying it on the following graph, find the shortest path distance between every pair of vertices.</p> 	20	CO3
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Q 11	<p>Apply Dijkstra's algorithm on the following graph to determine the shortest path from the vertex a to vertex z .</p> 	20	CO3
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OR

Find the shortest distance from vertex A to vertex F from the following network diagram, using Dijkstra's algorithm.

