UNIVERSITY WITH A PURPOSE

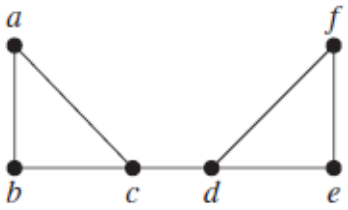
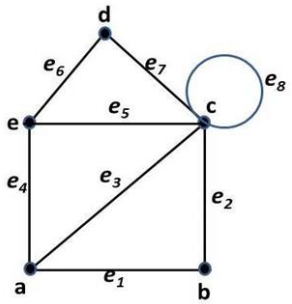
UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2021

Course: Graph Theory — **Semester :III**
Program: B.Tech. (Minor –RSDV) — **Duration : 03 hrs.**
Course Code: MRRS 0203 — **Max. Marks: 100**

Instructions: All questions are compulsory.

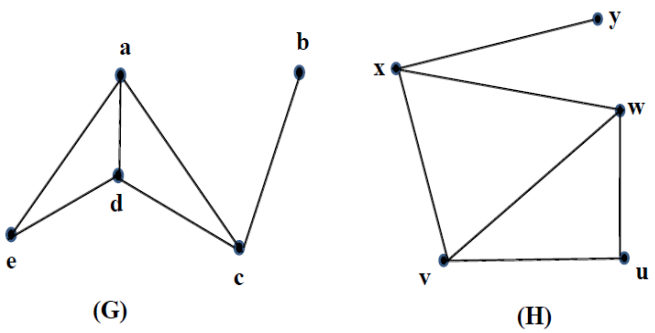
SECTION A

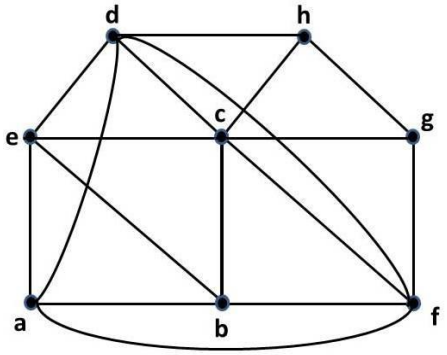
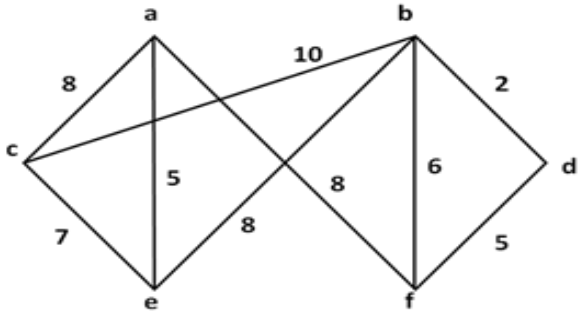
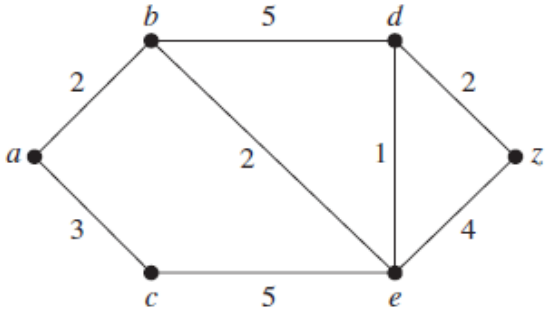
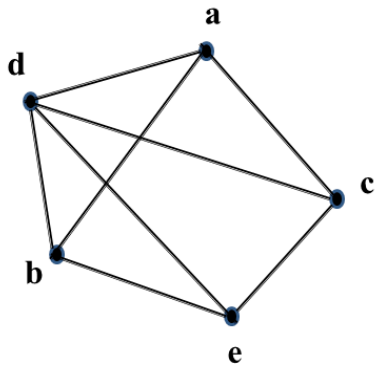
(Scan and upload) **(5Qx 4M = 20 Marks)**

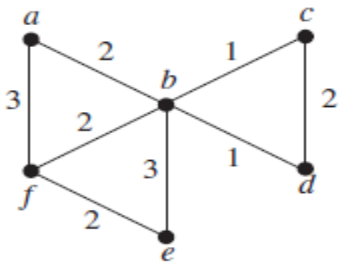
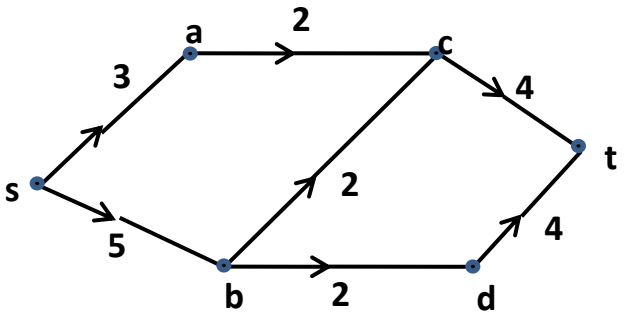
		Marks	COs
Q 1	Give an example of each of the following graphs i. 3 regular but not complete, and ii. 3 regular and complete	4	**CO1**
Q 2	G is a non-directed simple graph with 12 edges. If it has 6 vertices each of 3 degrees and the rest vertices have the degree less than 3 then determine the minimum number of vertices in the graph G.	4	**CO1**
Q 3	Determine all the cut vertices and at least one cut set in the given graph. 	4	**CO2**
Q 4	Determine at least one example of each of the following if possible in the given graph (i). Path from the vertex a to d (ii). Path from the vertex a to d including all the edges 	4	**CO2**
Q 5	A tree has two vertices of degree 2, one vertex of degree 3 and three vertices of degree 4. How many vertices of degree 1 does it have?	4	**CO3**

SECTION B

(Scan and upload) **(4Qx10M = 40 Marks)**

Q 1	Define isomorphism between two graphs. Determine whether the given pair of graphs is isomorphic or not. Give the explanation. 	10	**CO1**

Q 2	Give an example of each of the following graphs i. Eulerian as well as Hamilton, ii. Eulerian but not Hamiltonian, iii. Hamiltonian but not Eulerian, and iv. Neither Eulerian nor Hamiltonian.	10	**CO1**
Q 3	Define vertex colouring. Explain Welch-Powell algorithm and using this algorithm determine the coloring of the graph as shown below and hence determine the chromatic number $\chi(G)$. 	10	**CO2**
Q 4	Using Kruskal's algorithm, determine a minimal spanning tree of the weighted graph given below. 	10	**CO3**
	SECTION-C **(Scan and upload)** **(2Qx 20M= 40 Marks)**		
Q 1 A	Using Dijkstra's algorithm, determine the length of the shortest path and hence the shortest path in the following graphs from *a* to *z*. 	10	**CO2**
Q 1 B	Using the decomposition theorem, determine the chromatic polynomial, and hence the chromatic number of the graph as shown below. 	10	**CO2**

Q 2 A	Using Prim's algorithm, determine a minimal spanning tree for the given weighted graph. 	10	**CO3**
Q 2 B	Determine the maximum flow of the network as shown below using Ford-Fulkerson algorithm and also the cut with capacity equal to the maximum flow. 	10	**CO3**