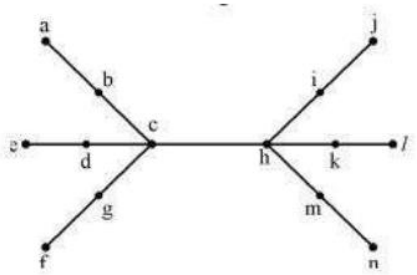
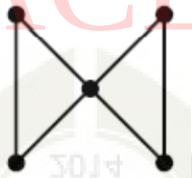
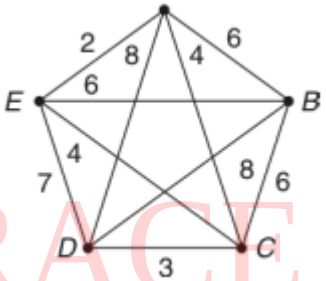
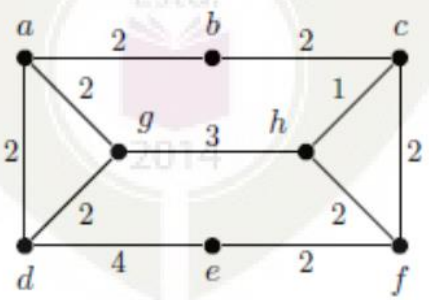
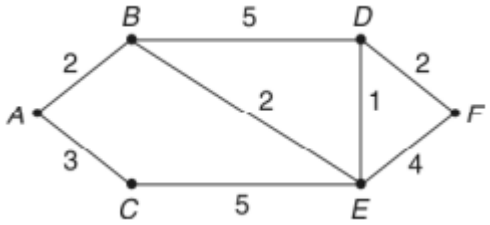
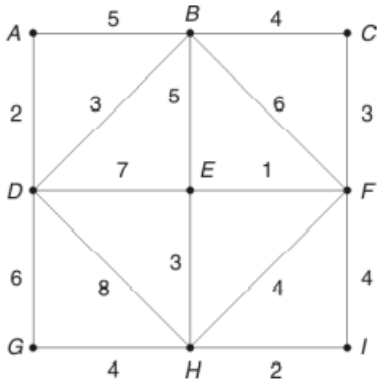
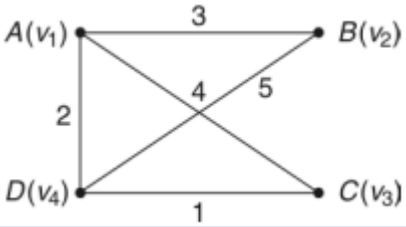
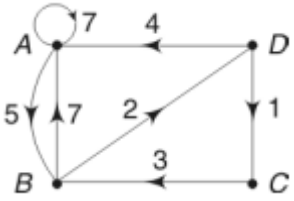
<MAT206-Graph theory>

Module 3				
Sl. No.	**Question**	**Marks**	**CO**	**BL**
1	Define eccentricity of a vertex and hence find the center of the following tree. 	**3**	**CO3**	**L1**
2	What is the sum of the degrees of any tree of n vertices?	**3**	**CO3**	**L1**
3	A tree has 5 vertices of degree 2, 3 vertices of degree 3 and 4 vertices of degree 4. How many vertices of degree 1 does it have?	**3**	**CO3**	**L2**
4	How many spanning trees are there for the following graph? 	**3**	**CO3**	**L1**
5	How many labelled trees are there with n vertices? Draw all labelled trees with 4 vertices.	**3**	**CO3**	**L1**
6	Find the number of labelled trees with n vertices and hence draw all the labelled trees with 3 vertices	**3**	**CO3**	**L3**
7	Define spanning tree with suitable example.	**3**	**CO3**	**L1**
8	Prove that a connected graph G with n vertices and n-1 edges ia a tree.	**5**	**CO3**	**L2**
9	Define binary tree. Prove that the number of pendant vertices in a binary tree with n vertices is $\frac{n+1}{2}$	**5**	**CO3**	**L2**
10	Plot a maximum level and minimum level binary tree with 11 vertices.	**5**	**CO3**	**L2**

11	Prove that in any tree (with 2 or more vertices) there are at least 2 pendant vertices.	**5**	**CO3**	**L2**
12	Prove that a tree with n vertices has (n-1) edges.	**7**	**CO3**	**L3**
13	Discuss the centre of a tree and prove that every tree has either one or two centers.	**7**	**CO3**	**L2**
14	Prove that G is a tree if and only if there is one and only one path between every pair of vertices.	**7**	**CO3**	**L2**
15	Write Kruskal's algorithm for finding minimum spanning tree. Find the minimum spanning tree for the weighted graph shown below using Kruskal's algorithm. 	**9**	**CO3**	**L3**
16	Write Prim's algorithm for finding minimum spanning tree. Find a minimum spanning tree in the following weighted graph, using Prim's algorithm 	**9**	**CO3**	**L3**
17	Write Dijkstra's shortest path algorithm and hence find the shortest path between the vertices A and in the weighted graph given below.	**9**	**CO3**	**L3**

				
18	Use Kruskal's algorithm to find a minimum spanning tree for the weighted graph shown below. 	**9**	**CO3**	**L3**
19	Find the shorted distance matrix and the corresponding shortest path matrix for all the pairs of vertices in the undirected graph given using Warshall's algorithm. 	**9**	**CO3**	**L3**
20	Find the shortest distance matrix and the corresponding shortest path matrix for all the pairs of vertices in the following directed weighted graph using Warshall's algorithm. 	**9**	**CO3**	**L3**

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Module 4				
Sl. No.	**Question**	**Marks**	**CO**	**BL**
1	Define edge connectivity, vertex connectivity and separable graphs. Give an example for each.	**3**	**CO4**	**L1**
2	Draw Kuratowski's Two graphs.	**3**	**CO4**	**L1**
3	Explain geometrical dual (G*) of a graph with an example.	**3**	**CO4**	**L1**
4	Show that in a simple connected planar graph G having V-vertices and E-edges E <= 3V - 6.	**3**	**CO4**	**L2**
5	Define fundamental circuits and fundamental cut-sets.	**3**	**CO4**	**L1**
6	If G is a 5-regular simple graph and |V| = 10, prove that G is non-planar.	**3**	**CO4**	**L2**
7	State Euler's theorem and determine whether a graph G with 1000 vertices and 3000 edges is planar.	**5**	**CO4**	**L3**
8	Prove that the vertex connectivity of any graph G can never exceed the edge connectivity of G.	**5**	**CO4**	**L2**
9	Prove that the maximum vertex connectivity of a graph with n vertices and e edges is the integral part of the number 2e/n.	**5**	**CO4**	**L2**
10	Prove that a connected graph with n vertices and e edges has e-n+2 regions.	**7**	**CO4**	**L2**
11	A vertex v in a connected graph G is a cut-vertex if and only if there exist two vertices x and y in G such that every path between x and y passes through v	**7**	**CO4**	**L2**
12	Prove the statement: Every cut set in a connected graph G must also contain at least one branch of every spanning tree of G.	**7**	**CO4**	**L2**
13	With respect to a given spanning tree T, a chord c_i that determines a fundamental circuit γ occurs in every fundamental cut-set associated with the branches in γ and in no other.	**7**	**CO4**	**L2**

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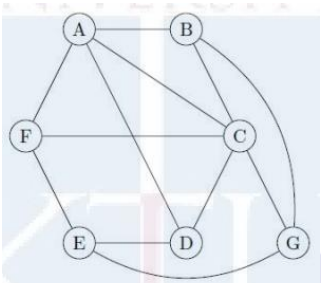
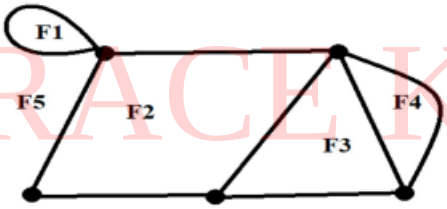
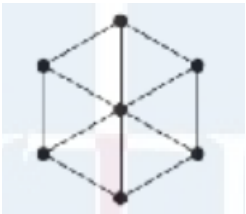
14	State Kuratowski's theorem and use it to show that the graph G below is not planar. Draw G on the plane without edges crossing. Your drawing should use the labelling of the vertices given. 	**9**	**CO4**	**L3**
15	State Kuratowski's theorem and show that Petersen Graph is nonplanar using Kuratowski's theorem.	**9**	**CO4**	**L3**
16	Define cut-set. Prove that every circuit in G has an even number of edges in common with any cut-set.	**7**	**CO4**	**L2**
17	Construct the geometric dual of the graph below 	**6**	**CO4**	**L3**
18	Prove the statement: Every cut set in a connected graph G must also contain at least one branch of every spanning tree of G.	**5**	**CO4**	**L2**
19	Let G be a connected graph and e an edge of G. Show that e is a cut-edge if and only if e belongs to every spanning tree.	**7**	**CO4**	**L3**
20	Draw the geometrical dual (G*) of the graph given below, also check whether G and G* are self-duals or not, substantiate your answer clearly 	**7**	**CO4**	**L3**