CBCS SCHEME

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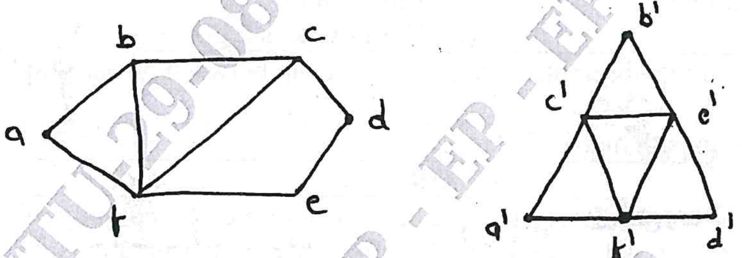
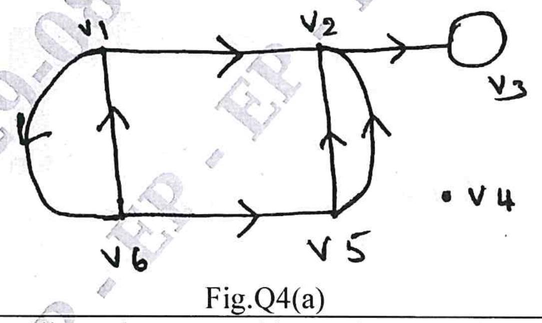
BCS405B

Fourth Semester B.E./B.Tech. Degree Examination, June/July 2024

Graph Theory

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Define graph. List and explain the types of graph.	08	L1	CO1
	b.	Prove that the number of vertices of odd degree in a graph is always even.	06	L2	CO1
	c.	Define isomorphic graph and verify the following graphs are isomorphic or not. [Refer Fig.Q1(c)]  Fig.Q1(c)	06	L2	CO1
		OR			
Q.2	a.	Explain the following graphs: (i) Bi-partile graph (ii) Sub graphs (iii) WALK (iv) Path	10	L1	CO1
	b.	Prove that a simple graph with n vertices and K components can have at most (n – K)(n – K + 1)/2 edges.	10	L2	CO1
		Module – 2			
Q.3	a.	State and prove necessary condition of a graph to be a Euler graph.	10	L2	CO2
	b.	List and explain the different operations on graph.	10	L2	CO2
		OR			
Q.4	a.	Define diagraph. Find the indegree and outdegree of the following graph [Fig.Q4(a)].  Fig.Q4(a)	08	L2	CO2
	b.	Illustrate the travelling salesman problem using a graph.	06	L2	CO2
	c.	List and explain different digraphs and binary relations.	06	L2	CO2
		Module – 3			
Q.5	a.	Define a tree. Prove that in a graph G there is one and only one path between every pair of vertices, G is a tree.	06	L1	CO3

	b.	Explain the following: (i) Cut-edge (ii) Cut-vertex (iii) Cut-set	06	L1	CO3
	c.	Find and construct the following: (i) Minimum possible height of 11 vertex binary tree (ii) A binary tree for a given 11 such that the farthest vertex is as far as possible from the root that must have exactly 2 vertices at each level, except at zero level.	08	L2	CO3
		OR			
Q.6	a.	Prove that every circuit has an even number of edges in common with any cut set.	10	L2	CO3
	b.	Prove that ring 50 m of any two cut-sets in a graph is either a third cut-set or an edge disjoint union of cut-sets.	10	L2	CO3
		Module – 4			
Q.7	a.	Define the following: (i) Planar graph (ii) Embedding (iii) Non-planar (iv) Kuratowski's 2 graph	08	L2	CO4
	b.	Explain the simple observation mode relationship between planar graph and dual G*.	08	L2	CO4
	c.	Write a note on path matrix.	04	L1	CO4
		OR			
Q.8	a.	Prove that two graphs G1 and G2 are isomorphic if and only if their incidence matrices A(G1) and A(G2) differ only by permutations of rows and columns.	10	L2	CO5
	b.	Describe the observations that can be made about circuit matrix B(G) 01 and graph G.	10	L2	CO5
		Module – 5			
Q.9	a.	Prove that every tree with two or more vertices is 2 - chromatic.	10	L2	CO5
	b.	Explain the following for chromatic polynomial: (i) Finding a maximal independent set (ii) Finding all maximal independent set.	10	L2	CO5
		OR			
Q.10	a.	Prove that the vertices of every planar graph can be properly colored with five colors.	10	L2	CO5
	b.	Explain the Greedy colouring algorithm.	10	L2	CO5

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