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TCS–604/TIT–604

B. Tech. (CSE/IT) (Sixth Semester)
End Semester EXAMINATION, 2017
GRAPH THEORY

Time : Three Hours] [*Maximum Marks : 100*

Note : (i) This question paper contains *five* questions.

(ii) All questions are compulsory.

(iii) Instructions on how to attempt a question are mention against it.

(iv) Total marks assigned to each question are twenty.

1. Attempt any *two* questions of choice from (a), (b) and (c). (2×10=20 Marks)

(a) Define the following with example. Complete graph, Pendant vertex and Unicursal graph. Draw the following :

(W_7 and 5-Regular)

(b) Prove that a connected graph G is Euler graph iff all vertices of G are of even degree.

(c) Explain Bipartite-graph and Complete bipartite graph with example. What is the Chromatic Number ? Draw $K_{5,9}$.

2. Attempt any *two* questions of choice from (a), (b) and (c). (2×10=20 Marks)

(a) What is a Tree ? Why is it called minimally connected ? Draw 6 non-isomorphic trees with six vertices.

(b) Prove that a simple graph G is a tree iff there is one path between every pair of vertices.

(c) Differentiate between binary tree and full binary tree with example ? Draw all labelled trees of 4 vertices.

3. Attempt any *two* questions of choice from (a), (b) and (c). (2×10=20 Marks)

(a) Find the maximum flow in the network given below (Fig. 1) :

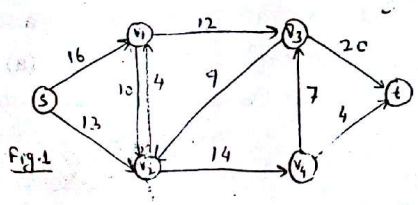

Fig. 1

(b) What is a spanning tree and minimal spanning tree ? Find the minimal spanning tree using Prim's algorithm in the graph given below (fig 2).

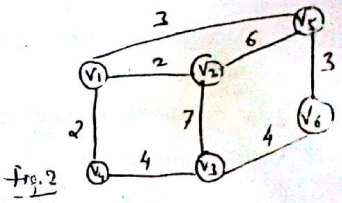

Fig. 2

(c) Explain Kuratowski's two graph.

4. Attempt any *two* questions of choice from (a), (b) and (c). (2×10=20 Marks)

(a) What are isomorphic graphs ? What is the use of adjacency matrix in isomorphism ? Consider the graph and find the subgroup M (V′, E′) generated by :

(i) V′ = {*b*, *c*, *d*, *e*, *f*}

(ii) V′ = {*a*, *c*, *e*, *g*, *h*}

(iii) V′ = {*c*, *f*, *g*, *h*}

Which of the following are isomorphic ?

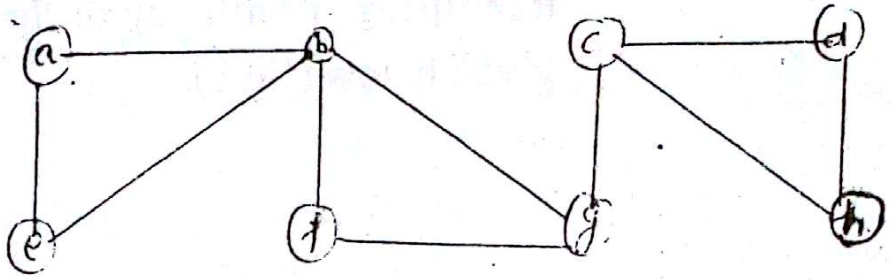

Fig. 3

(b) Construct a graph with the following properties :

Edge connectivity of G = 4

Vertex connectivity of G = 3

Degree of every vertex of G > = 5.

(c) If B is a circuit matrix of a connected graph G with e edges and n vertices, then show that rank of B = $e - n + 1$.

5. Attempt any *two* questions of choice from (a), (b) and (c). (2×10=20 Marks)

(a) What is Chromatic Polynomial ? Find chromatic polynomial for K_4.

(b) An m-vertex graph is a tree if and only if its chromatic polynomial is given by $P_m(n) = n(n-1)^{m-1}$.

(c) Explain four colour problem with example.