

Reg. No. :

--	--	--	--	--	--	--	--	--	--

B.E. / B.Tech (Full Time) DEGREE END SEMESTER EXAMINATIONS NOV/DEC 2012

SIXTH SEMESTER

CS 9032 – GRAPH THEORY

REGULATIONS – 2008

Time : 3 hours

Max. Marks : 100

Answer ALL Questions

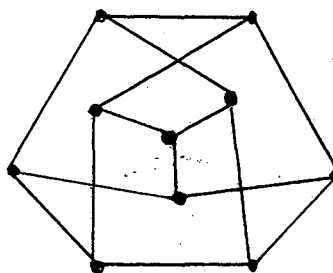
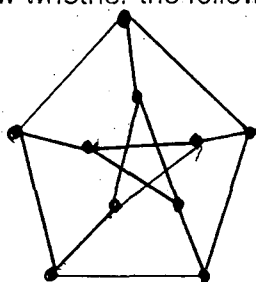
PART A – (10 x 2 = 20 marks)

1. Draw a simple graph and a non-simple graph with no loops, each with 5 vertices and 8 edges.
2. Show that every tree has either one or two centers.
3. Draw a complete graph of five vertices and draw any two spanning trees of the graph. Find the distance between the two spanning trees.
4. What is 1-isomorphism?
5. In an incidence matrix, what does a row with all 0s represent and what is number of 1s in each row equal to?
6. What is meant by the covering of a graph?
7. Given the adjacency matrix of a graph, how is it possible to determine whether a graph is connected or not?
8. Before finding the directed circuits in a graph, if the vertices with zero in-degree or zero out-degree are deleted successively, how is the finding of the directed circuits affected?
9. What is called shortest distance arborescence?
10. Is a simple graph for which the number of edges is greater than $3n-6$, where n is the number of nodes, planar or non-planar? Why?

PART B – (5 x 16 = 80 marks)

11. a) Show whether the following graphs are isomorphic or not.

(8)

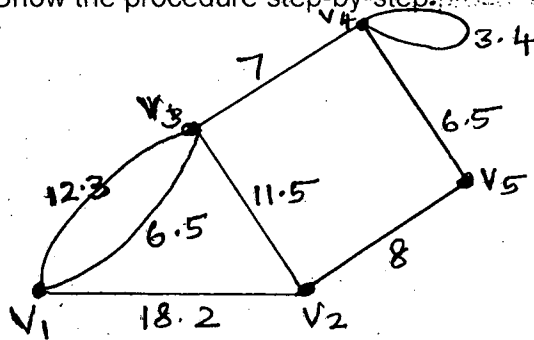


- b) Prove that a given connected graph G is an Euler graph if and only if all vertices of G are of even degree.

(8)

12 a) (i) Prove that any given edge of a connected graph G is a branch of some spanning tree of G . (8)

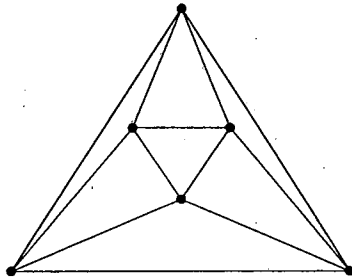
(ii) Using Prim's algorithm, find a minimal spanning tree for the graph given below. Show the procedure step-by-step. (8)



(OR)

12 b) (i) Prove that with respect to a given spanning tree T , a branch b_i that determines a fundamental cut-set S is contained in every fundamental circuit associated with the chords in S , and in no others. (8)

(ii) State and prove Euler's formula that gives the number of regions in any planar graph. Verify Euler's formula for the following graph. (8)



13. a) (i) With an example, show that for a simple disconnected graph of k components and n vertices, the rank of the incidence matrix is $n-k$. (8)

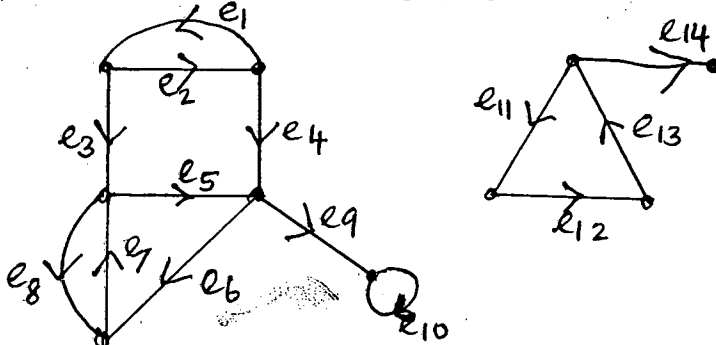
(ii) Prove that every tree with two or more vertices is 2-chromatic. (8)

(OR)

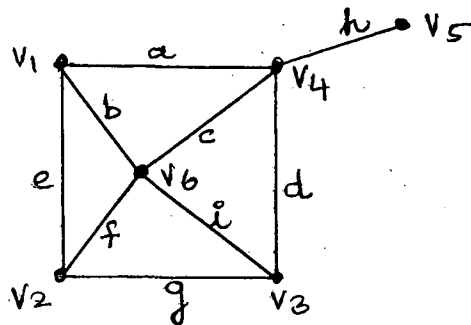
13. b) (i) Prove that in a bipartite graph, a complete matching of a set of vertices V_1 into a set of vertices V_2 exists if there is a positive integer m for which the following condition is satisfied:

degree of every vertex in $V_1 \geq m \geq$ degree of every vertex in V_2 (8)

(ii) Find the condensation of the graph given below. (8)

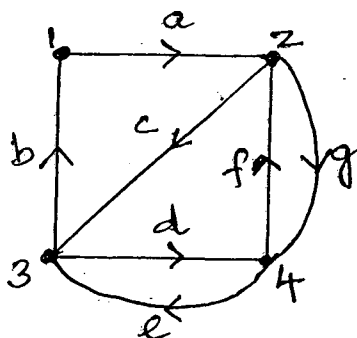


14. a) Find all the fundamental circuits in the following graph using Paton's algorithm. Explain the procedure step-by-step. (16)

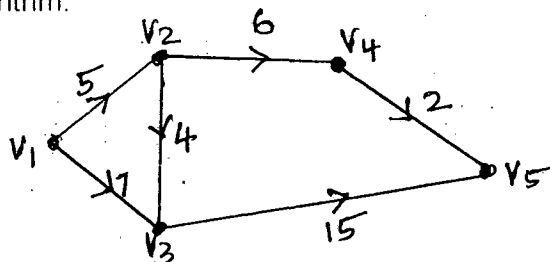


(OR)

14. b) Find all the directed circuits in the following graph using Roberts and Flores' algorithm. Explain the procedure step-by-step. (16)



15. a) Find the shortest path between all pairs of vertices in the following graph using Warshall-Floyd algorithm. (16)



(OR)

15. b) Use Depth First Search on the following graph to divide the graph into palm and fronds. Find a spanning arborescence of the graph. Explain the procedure step-by-step. (16)

