Printed pages: 2 **Sub Code : ECS505**

Paper Id: | 1 | 0 | 2 | 7 | **Roll No.** | | | | | | | | | |

B.TECH

(SEM. V) THEORY EXAMINATION 2017-18

GRAPH THEORY

Time: 3 Hours ***Total Marks: 100***

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.
2. Any special paper specific instruction.

SECTION A

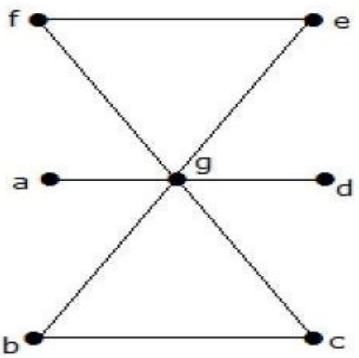
1. Attempt *all* questions in brief. **2 x10 = 20**

a. Write few problems solved by the applications of graph theory.
b. Define incidence, adjacent and degree.
c. Define null graph.
d. List out few properties of tree.
e. Define isomorphism.
f. What is distance in a tree?
g. Define Euler graph.
h. How fundamental circuits created?
i. Define vertex connectivity.
j. What is Hamiltonian path?

SECTION B

2. Attempt any *three* of the following: **10 x 3 = 30**

a. Show that :
(i) A graph is a tree if and only if it is minimally connected.
(ii) A graph G with n vertices, n-1 edges and no circuits is connected.
b. Write the Kruskal's algorithm for finding the minimum spanning tree of a graph, Illustrate the algorithm using an example.
c. What do you mean by planarity of graph G? Discuss the Euler's formula for finding the planarity of a graph with suitable example.
d. Define the chromatic number and chromatic polynomial of a graph. Find the line covering number for the following graph ?



e. Explain thickness, crossing and covering with example. Define five color problems. are there any graphs that cannot be colored with four colors?

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SECTION C

3. Attempt any *one* part of the following: 10 x 1 = 10

(a) Find the relationships among Af, Bf, and Cf. Where Af , Bf and Cf represents incidence matrix, fundamental circuit matrix and fundamental cut set matrix of a connected graph, respectively. Also define the incidence matrix of a connected graph with n vertices and e edges and prove that rank of incidence matrix of the graph is n – 1.

(b) Let 'G' be a connected planar graph with 20 vertices and the degree of each vertex is 3. Find the number of regions in the graph.

4. Attempt any *one* part of the following: 10 x 1 = 10

(a) Explain geometrical dual and combinational dual graphs.

(b) Explain diameter and radius of a tree with example. Find the condition under which the diameter of a tree is equal to twice the radius.

5. Attempt any *two* parts of the following: 5 x 2 = 10

(a) What is a bipartite graph? How can you determine whether an undirected graph is bipartite?

(b) What is it meant by the basis Vectors of a graph? Explain with an example.

(c) Show that every planar graph is 5-colorable.

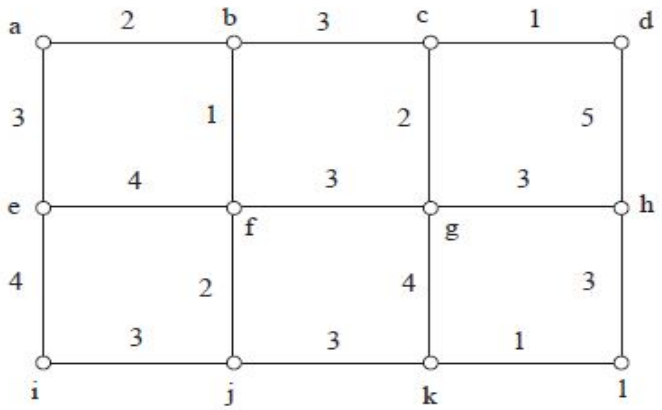
6. Attempt any *one* part of the following: 10 x 1 = 10

(a) Show that the Kuratowski's second graph is nonplanar.

(b) Suppose G and G' are two graphs having n vertices. For what values of n is it possible for G to have more components and edges than G' ?

7. Attempt any *two* parts of the following: 5 x 2 = 10

(a) Use the algorithm of Prim's or Kruskal's, to find a minimum spanning tree of the following graph :



(b) Discuss the travelling-Salesman problem.

(c) Find all nonisomorphic simple graphs of order 4.

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