(Pages : 4) **H – 3416**

Reg. No. : .....

Name : .....

**Eighth Semester B.Tech. Degree Examination, November 2019**

**(2008 Scheme)**

**08.805 (4) : GRAPH THEORY (ELECTIVE III) (R)**

**(Common with F 08.805C)**

Time : 3 Hours Max. Marks : 100

PART – A

Answer **all** questions. Each question carries **4** marks

1. Prove the following.
"A Graph G is disconnected if and only if its vertex set V can be partitioned into two non empty disjoint subsets $V_1$ and $V_2$ such that there exists no edge in G whose one end vertex is in $V_1$ and other in $V_2$"

2. Find the number of vertices of a graph with 12 edges, where 6 vertices have degree 3 and other vertices have degree less than 3. Draw the graphs.

3. Prove that in any undirected graph, the number of vertices of odd degree should be even.

4. Define the term fundamental circuit. Give an example.

5. If a connected graph G has n vertices, e edges and r regions, then prove that $n - e + r = 2$.

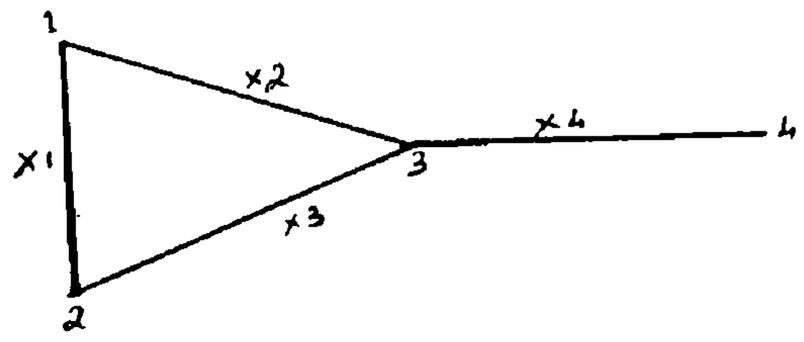
6. Prove that the ring sum of two circuits in a graph G is either a circuit or an edge disjoint union of circuits.

P.T.O.

7. Distinguish between strongly and weakly connected digraphs.

8. Find the transmission matrix for the following contact network.






9. Explain the switching functions of m-cube.

10. Explain the properties of state Graphs in sequential switching networks.

**(10 × 4 = 40 Marks)**

PART – B

Answer **any one full** questions from **each** Module. Each question carries 20 marks

## Module – I

11. (a) Prove that a simple graph with n vertices and k components can have at the most $\frac{(n-k)*(n-k+1)}{2}$ edges. **8**

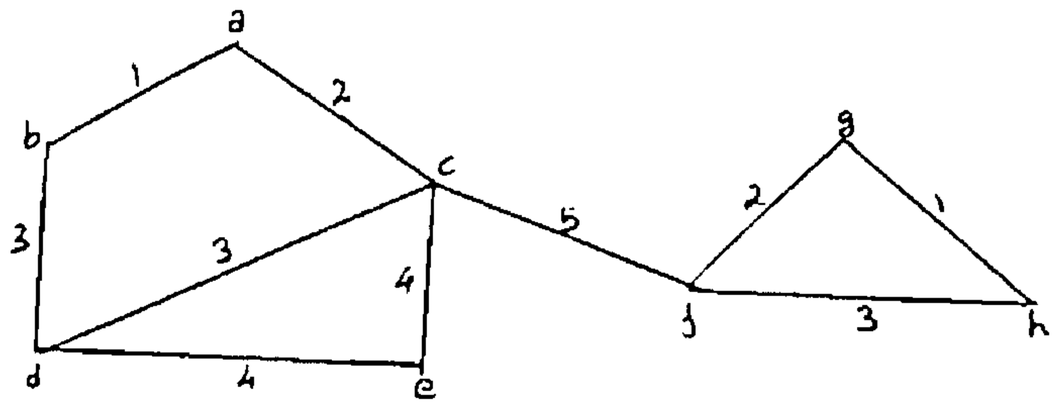
(b) Define Center of a graph. Prove that every tree has one or two centers **6**

(c) Prove that "in a complete graph with n vertices, there are $\frac{(n-1)}{2}$ edge disjoint Hamiltonian circuits, if n is an odd number $\geq 3$ **6**

OR

12. (a) Write and explain Prim's Algorithm. Analyze the complexity. **12**

(b) Consider the following Graph.

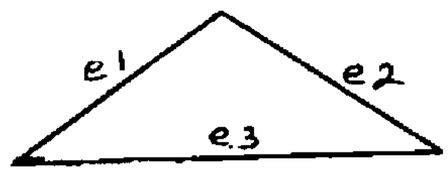



How many different MSTs can be obtained using Prim's algorithm starting from vertex 'a'? Draw all MSTs starting from vertex 'a'. **8**

## Module – II

13. (a) Define Geometric Dual and combinational Dual of a graph. Give Example. **8**

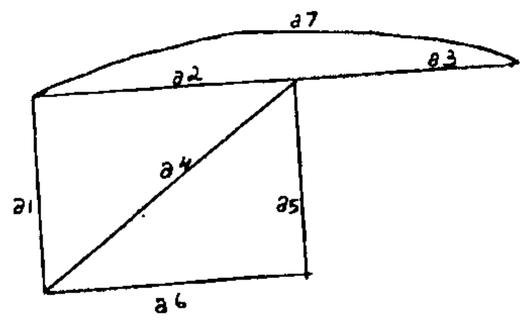
(b) For the graph given below check whether the circuit vector space $W_r$ is orthogonal complement to cutest vector space $W_s$. **6**




(c) Describe the methods used to check the planarity of a graph. **6**

OR

14. (a) Consider the graph.



(i) Define the basis of $W_r$ and $W_s$.

(ii) Write the basis of $W_r$ and $W_s$

(iii) Compute the subspaces $W_r$ and $W_s$

(iv) $W_r$ and Ws are orthogonal Complements? Justify. **10**

(b) A necessary and sufficient condition for two planar graphs $G_1$ and $G_2$ to be duals of each other is as follows:

There is one-to-one correspondence between the edges in $G_1$ and edges in $G_2$ such that a set of edges in $G_1$ forms a circuit if and only if the corresponding set in $G_2$ forms a cut-set. Prove it geometrically (consider a graph with atleast 6 vertices and 6 faces) **10**

## Module – III

15. (a) Write an algorithm to print the connected components of a graph. Analyze the complexity. **10**

(b) What are contact networks? Explain the synthesis of contact networks. **10**

OR

16. (a) Write an algorithm to find the directed circuits in a digraph. **10**

(b) Write brief notes on the application of graphs in coding theory. **10**

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