Roll No. .....

S–2135

M. A./M. Sc. (Second Semester) EXAMINATION, 2018

MATHEMATICS

Paper Fourth

(Graph Theory)

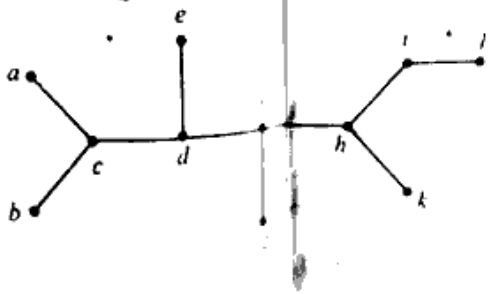
[MATH–C-010]

Time : Two Hours] [*Maximum Marks : 60*

Note : Attempt any *four* questions. All questions carry equal marks.

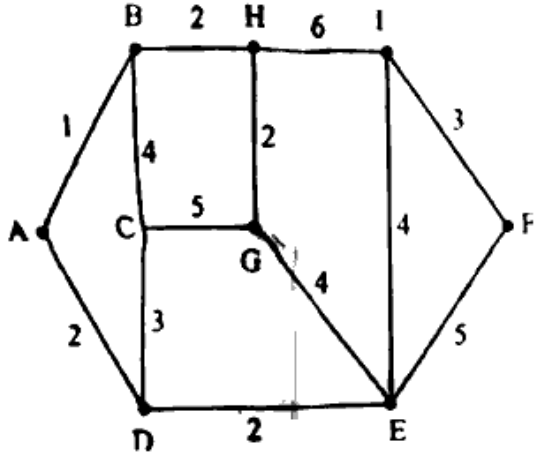
1. Write short notes on any *three* of the following with examples :
   (i) Binary Trees
   (ii) Spanning Trees
   (iii) Network Flows
   (iv) Rank and Nullity of Graphs
   (v) Colouring of a Graph
   (vi) Chromatic partitioning

2. (a) Define Radius, Diameter and Centre in a tree T. Find the radius, diameter and centre of the following tree T.

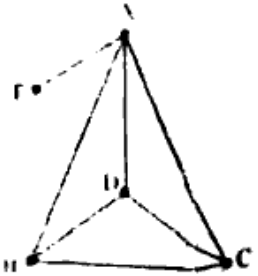


(b) If a tree T has n_1 vertices of degree 1, 2 vertices of degree 2, 4 vertices of degree 3 and three vertices of degree 4, then find n_1. Also draw the tree.

3. Explain weighted graph and weighted spanning tree of a graph G. Discuss Prim's algorithm to find minimal spanning tree T of G and obtain the minimal spanning tree T of the following graph G.

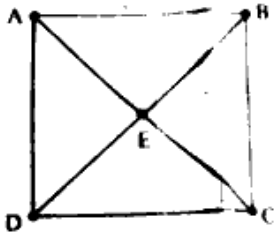


4. Explain Binary matrices associated with graphs. Discuss Adjacency matrix of a graph G. Find the Adjacency matrix of the following Graph G and deduce the observations based on the adjacency matrix.



Define chromatic polynomial.

5. (a) Find the chromatic polynomial of the following graph :



(b) Discuss dual graphs and self-dual graphs. Also discuss geometric and combinational dual and observations based on dual graph with examples.

6. Define expression tree to polish notation :

(a) Construct the tree for the following notations :

(i) $(3x - 5)^4 / a(zb + c)$

(ii) $(a - b + c . d) \div (g^2 + fh + k)$

(b) Explain preorder and inorder traversal of a binary tree. Draw the unique tree of the following :

Preorder	Inorder
x	q
b	b
q	c
a	a
c	g
f	p
d	e
e	d
r	r

7. Express any *two* of the following with some suitable examples :

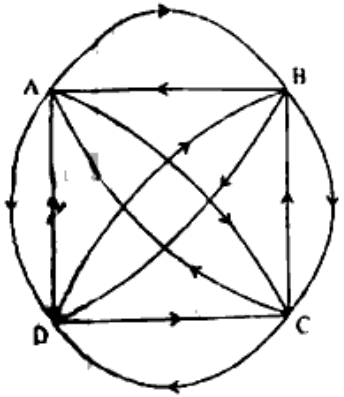
(i) Cut set matrix of a graph

(ii) Covering

(iii) Directed path and connectedness

(iv) Shortest path problem

8. (a) Explain weakly and strongly connected digraphs. Show that the following digraph is weakly connected or strongly connected.



(b) A graph G has the following adjacency matrix. Check whether the following is connected or not :

$$X(G) = \begin{bmatrix} 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 \end{bmatrix}$$