Bachelor of Science (Information Technology) (I.T.) Semester–V Examination

GRAPH THEORY

Paper–6

Time : Three Hours] [Maximum Marks : 50

N.B. :— (1) All questions are compulsory and carry equal marks.

(2) Draw neat diagrams wherever necessary.

EITHER

1. (A) Define the following terms :

(i) Graph

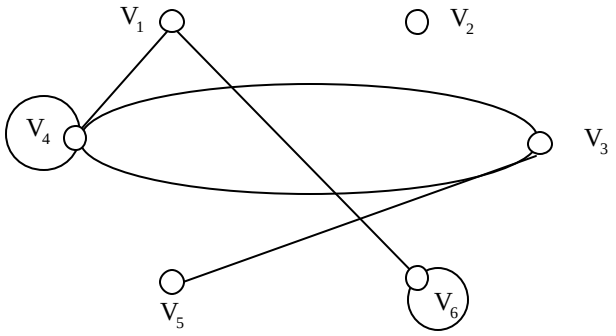
(ii) In degree

(iii) Out degree

(iv) Loop

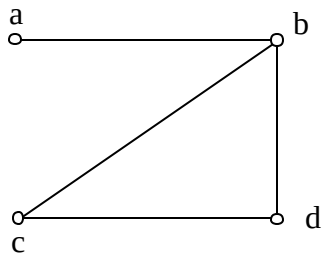
(v) Multigraph. 5

(B) Find the degree of each vertex in the multigraph as shown in the figure below. What is the degree of an isolated vertex V_2 ? 5



OR

(C) Consider the graph G(V, E) as shown in the following figure. Determine whether H(V', E') is a subgraph of G or not where :



(a) V' = {a, b, f} and E' = {(a, b), (a, f)}

(b) V' = {a, b, d} and E' = {(a, b), (a, d)} 5

(D) What is Isomorphic Graph ? Explain with an example. Also mention conditions for isomorphic graph. 5

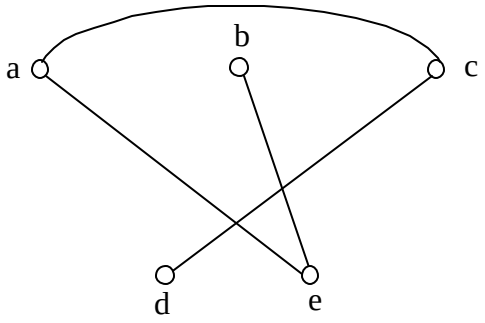
EITHER

2. (A) What is walk of a path ? Explain closed walk, open walk and length of a path with an example of each. 5

(B) Find the connected components of a graph G(V, E) where V = {a, b, c, d, e) and

(i) E = {(a, c), (b, e), (d, c), (e, a)}

(ii) E = ϕ for the given graph. 5



OR

(C) Define the following :

(i) Connected graph with example.

(ii) Distance and diameter.

(iii) Cut-point. 5

(D) What is Dijkstra's shortest path algorithm ? Give its advantages. 5

EITHER

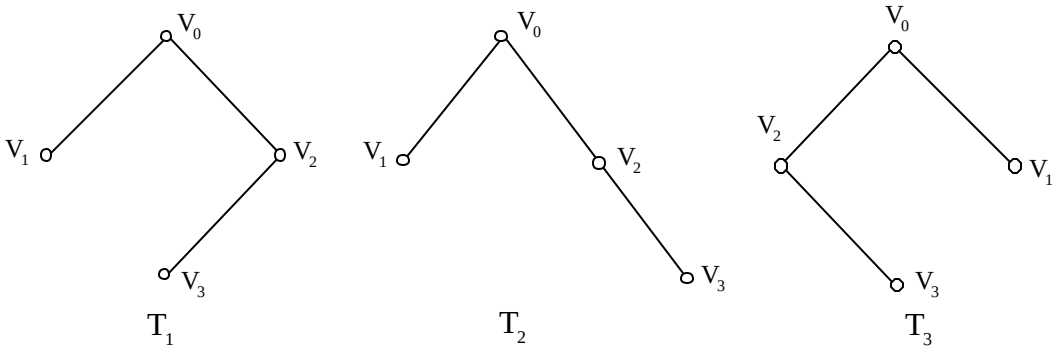
3. (A) Define Ordered Trees. Distinguish between a general tree and a binary tree. 5

(B) Consider the trees T_1, T_2 and T_3 as shown below. Identify trees which represent :

(a) rooted tree

(b) ordered rooted tree

(c) binary tree. 5



OR

(C) Prove that a graph G is a tree if and only if it is minimally connected. 5

(D) Use Kruskal algorithm to find a minimal spanning tree for the connected weighted graph as shown below. The weight of each edge is given in terms of kilometers. 5

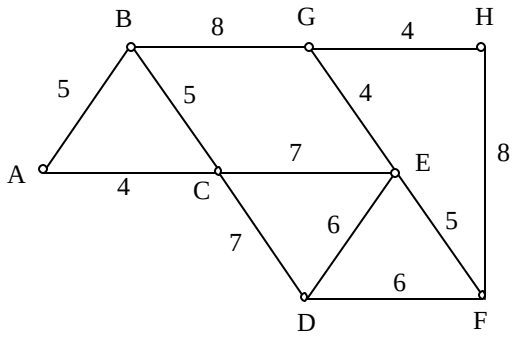


Figure – Connected Weighted Graph

EITHER

4. (A) Define the following :

(i) Simple Digraphs.

(ii) Symmetric Digraphs.

(iii) Equivalence Relation in Digraphs.

(iv) Transitive Relation in Digraphs.

(v) Reflexive Relation in Digraphs. 5

(B) Define Arborescence and prove that, An arborescence is a tree in which every vertex other than the root has an in-degree of exactly one. 5

OR

(C) Explain the following :

(i) Connected Digraphs.

(ii) Euler Digraph.

(iii) Application of Euler's Digraph. 5

(D) Define Network and Maximal Flow. Give its applications. 5

5. Attempt **all** :

(A) Define Ring sum of two graphs. 2½

(B) Give an example of vertex connectivity. 2½

(C) Explain fundamental circuit and cut-sets. 2½

(D) Explain circuit correspondence in a graphs. 2½