Total No. of printed pages = 9

END SEMESTER / RETEST EXAMINATION-2019

Semester : 6th (Old)

Subject Code : CO-606

GRAPH THEORY AND COMBINATORICS

Full Marks – 70

Time – Three hours

The figures in the margin indicate full marks for the questions.

Instructions :

1. *All* questions of PART–A are compulsory.
2. Answer any *five* questions from PART–B.

PART – A

Marks – 25

1. Fill in the blanks : 1×10=10

(a) A graph is a collection of _____ and _____.

(b) Length of the walk of a graph is the number of _____ in walk W.

[Turn over

(c) A graph with at least one cycle is called a _____ graph.

(d) A vertex with degree zero is called _____.

(e) If a graph can be drawn on a plane, it is called a _____.

(f) Other name for directed graph is _____ graph.

(g) _____ is a connected acyclic graph.

(h) A graph with all vertices having equal degree is known as_____.

(i) Distinct edges in a walk of a graph is called _____.

(j) The adjacency matrices of two graphs are identical only if the graphs are _____.

2. Write true or false : 1×10=10

(a) A graph having no edges is called a Null Graph.

(b) If the vertices of a walk W are distinct then W is called a path.

(c) A graph with no loops and no parallel edges is called a cyclic graph.

(d) A vertex with degree one is called a pendent vertex.

(e) Every planar graph divides the plane into connected areas called component.

(f) A connected cyclic graph is called a Tree.

(g) The minimum number of colours required for vertex colouring of graph 'G' is called as the perfect matching number of G.

(h) In a directed graph, each vertex has an indegree and an outdegree.

(i) A matching is a set of edges, no two of which share an edge.

(j) A simple example of error-detecting code is Vertex check.

3. Fill in the blanks with respect to the following graph (Fig. 1) : 1×5=5

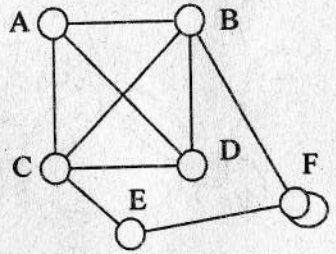

Fig. 1

(a) The number of edges is _____.

(b) The degree of vertex F is _____.

(c) The number of components of the graph is _____.

(d) The vertex D is adjacent to the vertices _____.

(e) A walk from vertex A to vertex F is _____.

PART – B

Marks – 45

4. (a) Write any three application of graph theory. 3

(b) Find the number of vertices, number of edges, and degree of each vertex in the following undirected graphs : (Fig. 2) 3

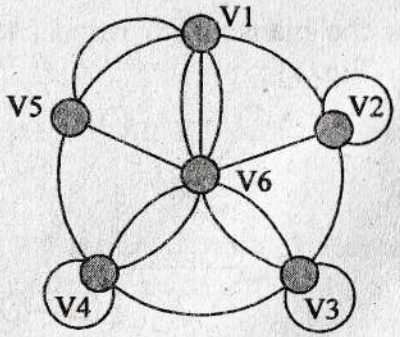

Fig. 2

(c) Draw a graph with degree sequence 2 3 3 4 4 6. 3

5. (a) Define Isomorphism of graphs. 3

(b) Check whether the following graphs (G1,G2) are isomorphic or not. (Fig. 3) 3

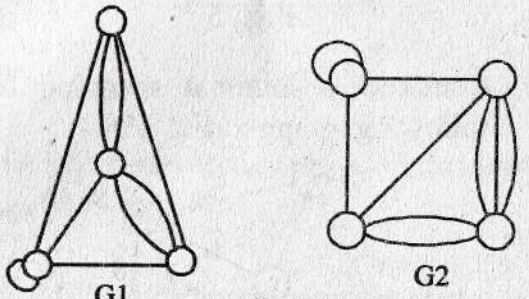

Fig. 3

(c) Find the adjacency matrix of the following graphs (Fig. 4) 3

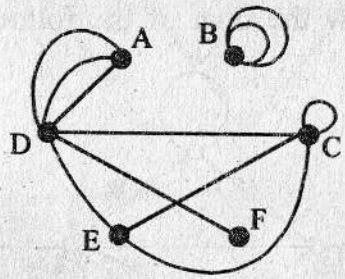

Fig. 4

6. (a) Define spanning tree. Find all the spanning tree of the following graph (Fig. 5) 3

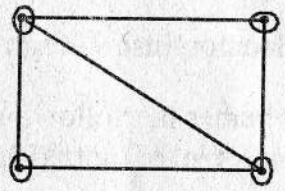

Fig. 5

(b) Construct a minimal spanning tree of the following graph : (Fig. 6) 3

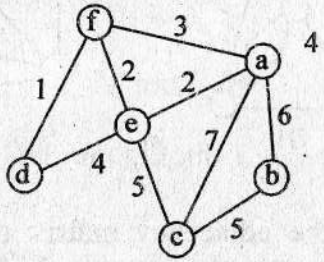

Fig. 6

(c) Draw the dual of the following graph (Fig. 7) 3

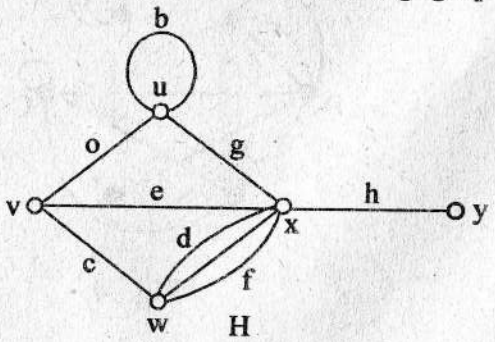

Fig. 7

7. (a) Define a planer graph. Prove Euler's formula for the following graph : (Fig. 8). 3

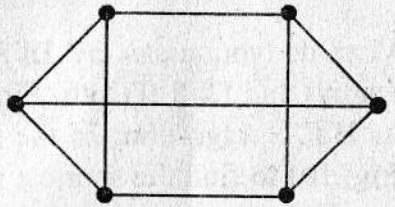

Fig. 8

(b) Define Connected Graph, Complete Graphs and Tournaments. 3

(c) Find the Chromatic number of the following Graph : (Fig. 9) 3

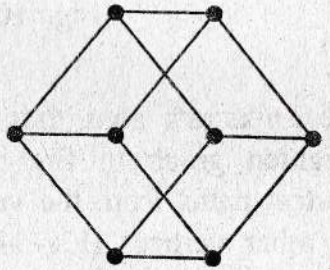

Fig. 9

8. (a) Define with example bipartite graph. What are Cut edges and Cut vertices ? Explain with examples. 2+3=5

(b) State and explain pigeon hole principle with examples. 4

9. (a) What do you mean by BFS (Breadth First Search) and DFS (Depth First Search) Carry out B.F. S algorithm on the following Graph (Fig. 10) to find the shortest path from vertex s to T ?

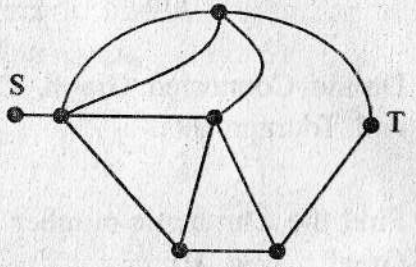

Fig. 10

(b) Use Dijkstra's algorithm on the connected weighted graph to find the length of the shortest paths from the vertex A to each of the other vertices (Fig 11)

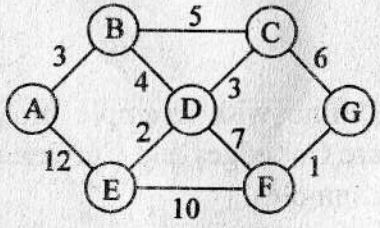

Fig. 11

10. Write briefly about sum and product rules. Give examples. State multinomial theorem with examples. 6+3=9

11. State Ramsey's Theorem. Write briefly about perfect matching with respect to marriage theorem. 3+6=9

12. Write briefly about error detecting codes and error correcting codes. 9