53 (CS 718) GRTH

2021

GRAPH THEORY

Paper : CS 718

Full Marks : 100

Time : Three hours

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

*Answer **any five** questions.*

1. *(a)* Define Graph. How can a graph be represented using a data structure ? What is regular graph ? 8

   (b) Define complement of a graph with sample. Show that if a graph G is disconnected, then its complement $\overline{G}$ is connected. 12

2. *(a)* What is a Hamiltonian graph ? Prove that in a simple graph G with $n(\geq 3)$ vertices and if degree of each vertex $(d(v) \geq n/2)$ then G is Hamiltonian. 12

Contd.

(b) Show that a graph is bipartite if it does not have any odd cycle. 8

3. (a) What is matching (M) in a graph. Show that a matching (M) is maximum if there is no augmenting path w.r.t.M. 12

(b) Describe independent and edge cover of a graph. 8

4. (a) Discuss the working of BFS and DFS with example. 12

(b) Describe the Prim's algorithm with example. 8

5. (a) Define vertex connectivity ($K(G)$) and edge connectivity ($K'(G)$) of a graph with example prove that $K(G) \leq K'(G)$. 16

(b) Define vertex cut and edge cut of a graph. 4

6. (a) State the vertex coloring problem. What is Chromatic number of a graph ? Evaluate chromatic number of a cyclic graph with odd and even number of vertices. 10

(b) Derive the relationship between chromatic number and maximum degree of a graph. 10

7. Write short notes on : ***(any four)*** 20

(i) Minimum spanning tree

(ii) Travelling Salesman Problem

(iii) Edge coloring

(iv) Bipartite graph

(v) Closure of a graph.