53 (IT 717) GRTH

2021

GRAPH THEORY

Paper : IT 717

Full Marks : 100

Time : Three hours

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

Answer ***any five*** *questions.*

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

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

2. *(a)* What is Graph? How can it be represented in memory? What is a complete graph? 8

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

Contd.

3. *(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) Describe the relationship between chromatic number and maximum degree of a graph. 10

4. *(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

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

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

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

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

7. Write short notes on : ***(any four)*** 5×4=20

(i) Closure of a graph

(ii) Edge coloring

(iii) Minimum spanning tree

(iv) Travelling Salesman Problem

(v) Bipartite graph.

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