

**R18**

Code No: 155FJ

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year I Semester Examinations, January/February - 2023

**GRAPH THEORY**

(Computer Science and Engineering – Artificial Intelligence and Machine Learning)

Time: 3 Hours

Max. Marks: 75

- Note:** i) Question paper consists of Part A, Part B.  
ii) Part A is compulsory, which carries 25 marks. In Part A, Answer all questions.  
iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

**PART – A****(25 Marks)**

- 1.a) Define a complete graph. [2]
- b) Draw at least three non-isomorphic graphs on four vertices. [3]
- c) What is block of graph? [2]
- d) Define connected graph and draw an example. [3]
- e) Define spanning tree. [2]
- f) What is Eulerian graph? Give an example. [3]
- g) Define a bipartite graph. [2]
- h) Write the necessary conditions for complete matching. [3]
- i) What is Chromatic number? [2]
- j) What is the use of Brook's Theorem? [3]

**PART – B****(50 Marks)**

- 2.a) Explain in detail about Isomorphism with a neat diagram and steps for finding isomorphism.
- b) Explain matrix representation of graphs and state its advantages. [5+5]

**OR**

- 3.a) What is Hamilton graph? State and define the Dirac's theorem.
- b) Define a spanning forest and show that if T is any spanning forest of a graph G, then (i) each cut set of G has an edge in common with T; (ii) each cycle has an edge in common with the complement of T. [5+5]

- 4.a) Describe all pairs shortest path problem with an example.
- b) State every connected graph G with  $n > 2$ , contains at least two vertices which are not cut-vertices. [5+5]

**OR**

- 5.a) Explain the cut-vertices and cut-edges with a neat diagram.
- b) Explain the connected, disconnected graphs, and maximal connected subgraphs with their components. [5+5]

- 6.a) State and explain Kruskal's algorithm in detail.  
b) Illustrate the Chinese postman problem with an example. [5+5]

**OR**

- 7.a) Explain in detail about the Cayley's theorem.  
b) Demonstrate the steps to show a graph is an Hamilton graph. [5+5]

- 8.a) What is independent set and explain max independent set problem.  
b) State and explain greedy algorithm for finding perfect match in graphs. [5+5]

**OR**

- 9.a) Give detailed note on minimal vertex covering problem.  
b) Explain about König's theorem. [5+5]

- 10.a) Show that every simple planar graph is 5-colourable.  
b) Explain about class-1 and class-2 graphs with suitable examples. [5+5]

**OR**

- 11.a) Explain in detail about the Vizing's theorem.  
b) Illustrate the graph coloring using greedy algorithm with suitable example. [5+5]

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