Reg. No. \_\_\_\_\_\_\_\_\_\_\_\_\_



**End Semester Examination – Nov / Dec – 2019**

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| **Code :** | **19MA3017** | **Duration :** | **3hrs** |
| **Sub. Name :** | **GRAPH THEORY AND ALGORITHMS** | **Max. Marks :** | **100** |

**ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

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| **Q. No.** | **Sub Div.** | | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | | Represent the maze given below by means of a graph such that a vertex denotes either a corridor or a dead end and an edge represents a possible path between two vertices. Number the vertices and solve the maze. | CO2 | 10 |
| b. | | Find the , , , fuse vertices  and  in , find  and  in the following graphs. | CO1 | 10 |
| **(OR)** | | | | | |
| 2. | a. | | Draw a graph with vertices representing the squares of a 6 x 6 chessboard. Join these vertices appropriately by edges, each representing a move of the knight. Find the degree of each vertex. | CO2 | 10 |
| b. | | Prove that a graph  is disconnected if and only if its vertex set can be partitioned into two nonempty, disjoint subsets  and  such that there exists no edge in  whose one end vertex is in subset  and the other in subset . | CO1 | 10 |
|  |  | |  |  |  |
| 3. | a. | | A connected graph  is Eulerian if and only if it can be decomposed into circuits. Prove. | CO1 | 10 |
| b. | | Draw the graph of the given incidence matrix and give five observations on it. | CO2 | 10 |
| **(OR)** | | | | | |
| 4. | a. | | State and prove Euler’s formula. Give the planar reperesentation of the graph given below and verify Euler’s formula on it. | CO1 | 10 |
| b. | | Give the circuit matrix for the graph given below and enumerate five observations on it. | CO2 | 10 |
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| 5. | a. | | Draw the graphs and , assign a proper colouring to them and find their chromatic number. | CO3 | 5 |
| b. | | What is the chromatic number of the graph given below? Assign a proper colouring of your choice. | CO3 | 5 |
|  | c. | | Give the Prim’s algorithm and hence find the minimum spanning tree for the given weighted graph. | CO5 | 10 |
| **(OR)** | | | | | |
| 6. | a. | | Give the Kruskal’s algorithm and hence find the minimum spanning tree for the given weighted graph. | CO5 | 10 |
| b. | | Using Dijkstra’s algorithm, find the shortest path between the vertex and the vertex for the graph given below. | CO5 | 10 |
|  |  | |  |  |  |
| 7. | a. | | Give the algorithm for the Breadth first search and hence find the spanning tree for the graph given. | CO5 | 10 |
|  | b. | | Give the algorithm for the Depth first search and hence find the spanning tree for the graph given. | CO5 | 10 |
| **(OR)** | | | | | |
| 8. | a. | | State and prove the Maxflow-Min cut theorem. | CO4 | 10 |
| b. | | Find the Maximum flow for the following network from  to . | CO4 | 10 |
|  | | | **Compulsory**: |  |  |
| 9. | | a. | Using graphical method, maximize , subjected to the constraints,        , | CO6 | 10 |
| b. | Using simplex method solve the LPP    Subject to | CO6 | 10 |