B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

February 2023 Semester End Main Examinations

I -2

Programme: B.E.   Semester: VII
Branch: All Branches   Duration: 3 hrs.
Course Code: 21MA7OECGT   Max Marks: 100
Course: Computational Graph Theory   Date:

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

UNIT - I

1 a) Illustrate the application of graphs in designing an efficient computer drum.   **5**

    b) The following graph shows roads connecting various areas in a city. The numbers on each represent the distance, in kms between the areas. Tyson wants to travel all the areas in the city with a minimum distance. Apply Prim's algorithm to help Tyson.   **8**
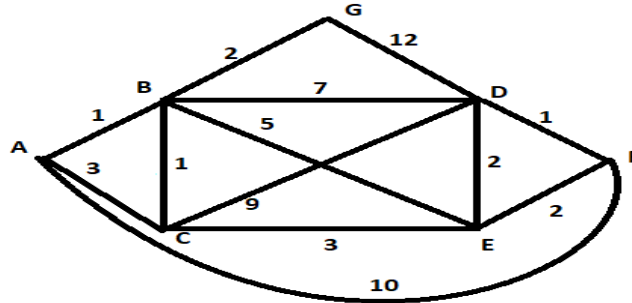
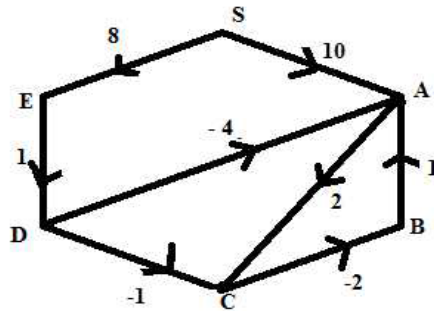   c) Construct a Depth First Search (DFS) spanning tree for the following graph: (order: alphabetical)   **7**
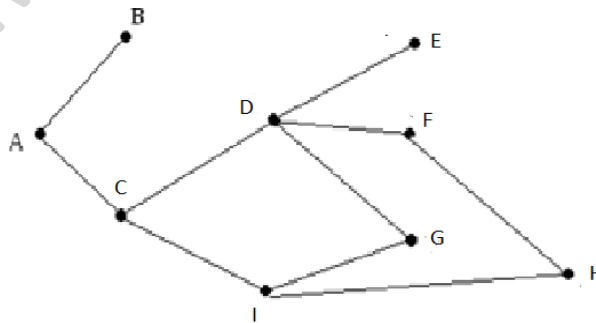
OR

2 a) Illustrate the application of graphs in job sequencing.   **5**

b) Use Bellman's Ford algorithm for the following graph to find the shortest path and shortest distance from the vertex S to B. **8**
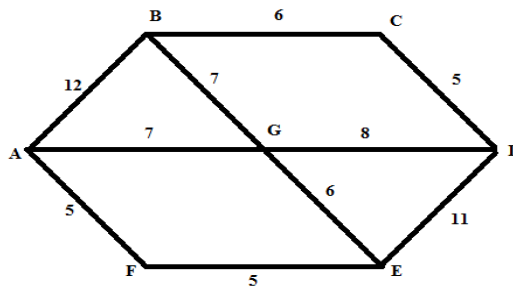

c) Apply Dijkstra's algorithm to the weighted digraph shown below to obtain the shortest distance and shortest path between the vertex A to each of the other vertices. **7**
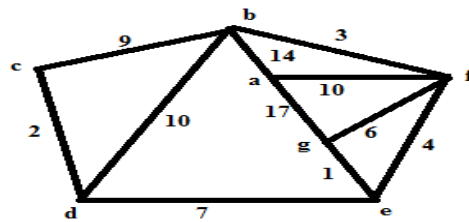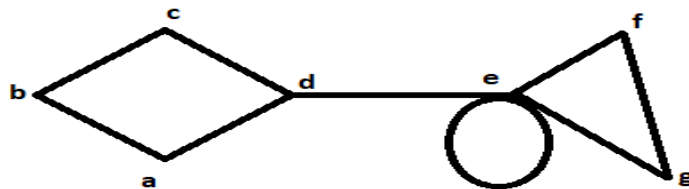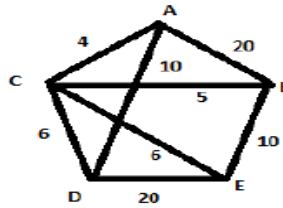

UNIT - II

3 a) Find the length of an optimal Chinese postman route for the network given below. **7**

b) Apply Fleury's algorithm to find an Eulerian circuit for the graph given below: **6**

c) Suppose a salesman needs to give sales pitches in five cities. He looks up the airfares in each city, and puts the costs in a graph. Find the shortest route for his travel and the associated cost. **7**
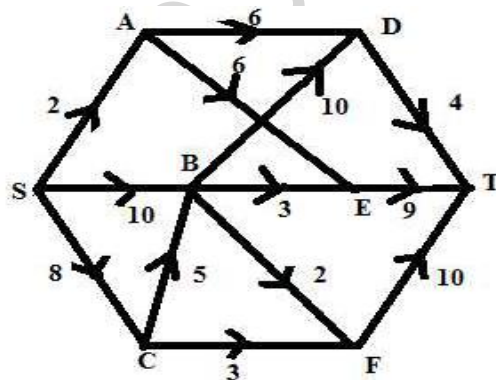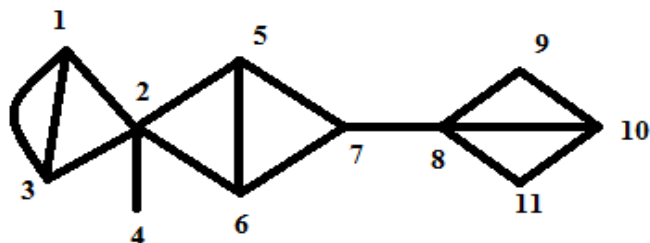
UNIT - III

4   a)   Prove that the following graph is 3-connected. Also obtain the pairwise edge-disjoint w, z-paths.   **6**
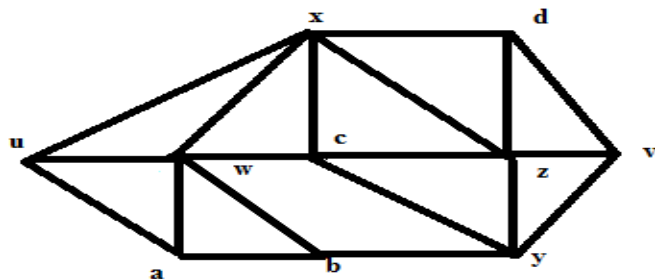
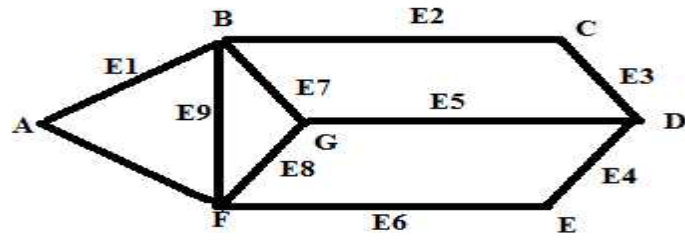b)   Obtain the maximum flow in the following network using Ford Fulkerson algorithm   **7**

c)   Compute the blocks of a graph G. Distinguish between the cut vertices and block vertices.   **7**
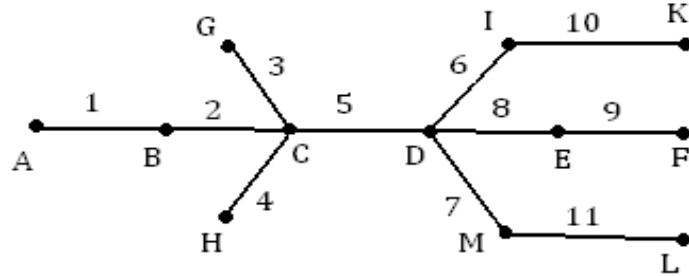

UNIT - IV

5   a)   Obtain the minimal vertex covering and a minimal edge covering for the following graph. Justify your answer.   **5**

b) Apply Blossom's algorithm to obtain an augmenting path **7**

c) Apply Gale Shapley algorithm to find a stable matching between Schools **8**
$\{S_1, S_2, S_3, S_4, S_5\}$ and students $\{A, B, C, D, E\}$. Initially the school
start with selection. Their preferences are :
$S_1 = \{A, B, C, D, E\}, S_2 = \{C, B, A, E, D\}, S_3 = \{A, D, E, C, B\}$
$S_4 = \{B, A, E, C, D\}, S_5 = \{C, A, E, D, B\}$ and
$A = \{S_3, S_4, S_1, S_5, S_2\}, B = \{S_2, S_1, S_5, S_4, S_3\}, C = \{S_3, S_2, S_1, S_5, S_4\}$
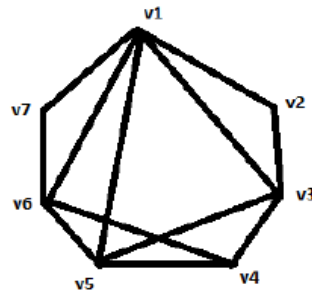$D = \{S_2, S_4, S_5, S_3, S_1\}, E = \{S_5, S_4, S_2, S_3, S_1\}$

UNIT - V

6 a) Write a note on the Five-color problem. **5**

b) Compute the chromatic polynomial for the graph shown below. If 5 colors are **8**
available, in how many ways can the vertices of this graph be properly colored
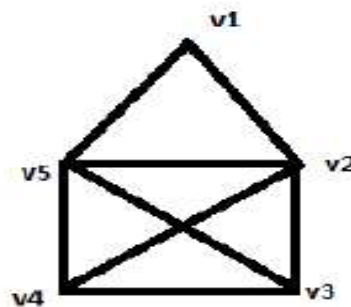
c) Apply Simple Sequential coloring algorithm to color the following graph. **7**

OR

7 a) Apply graph coloring to illustrate the scheduling final exams problem, where seven final exams at an institution are to be scheduled so that no student has two exams at the same time. **5**

b) Apply Simple Sequential coloring algorithm to color the following graph. **8**
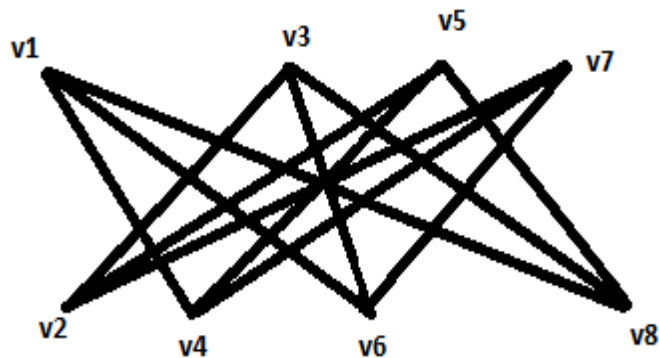
c) Compute the maximal number of independent sets of the following graph using Boolean expression. Also find at least three chromatic partitions. **7**

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