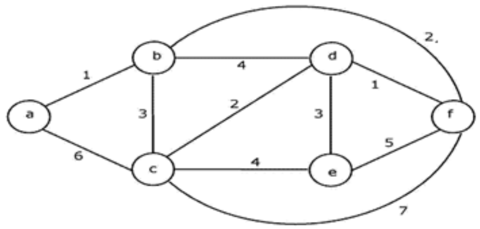
7. (a) Find the mininum spanning tree using Krushal's Algorithm and also find the minimum cost. 5



(b) Find the complement of the C5 graph. Also explain what is meant by self-complementary graph. 2

(c) Let δ and Δ denotes the minimum and maximum degree of a simple graph. And also e and V denotes number of edges and vertices of a graph. Prove that $\delta \leq \frac{2e}{V} \leq \Delta$. 3

8. (a) The degree sequence of a simple graph is the sequence of the degrees of the nodes in the graph in decreasing order. Which of the following sequences cannot be the degree sequence of any graph? Use Havel Hakemi Procedure.

(I) 7, 6, 5, 4, 4, 3, 2, 1

(II) 6, 6, 6, 6, 3, 3, 2, 2 4

(c) Explain with an example the following terms:

(a) Cut Sets (b) Cut Vertices (c) N-cube

(d) Wheel graph 6

****

B.Tech Even Semester Examination, May, 2025

Computer Science & Engineering

(4th Semester)

Course No: CSE-401

(Discrete Mathematics and Graph Theory)

Full Marks: 50

Pass Marks: 15

Time: 2 hours

Note:

1. Attempt any five questions.
2. Begin each answer in a new page
3. Answer parts of a question at a place
4. Assume reasonable data wherever required
5. The figure in the right margin indicates full marks for the question
6. All the mathematical symbols and abbreviations have their usual meanings.

1. (a) Suppose the average of 4 different integers is 20. Prove by the method of contrapositive that one of the integers is greater than 21. 3

(b) Let Z be the set of integers and R be the relation on Z defined by R= {(x, y): x, y $\in$ Z and x-y is divisible by 3}. Determine the equivalence classes generated by the elements of Z. 4

(c) The relation R on the set S of real number is defined as aRb iff (1+ab)>0. Show that R is reflexive and symmetric but not transitive.

2. (a) Prove that F: R$\rightarrow$ R defined by f(x) = $4x^3$-5 is a bijection. 4

Turn Over

(b) Prove by method of contradiction $\sqrt{3}$ irrational. 3

(c) Write the symbolic form, and negate the following statements:

(i) Some people are not admired by everyone.

(ii) Everyone should help his neighbours, or his neighbours will nothelp him. 3

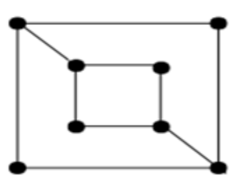
3. (a) Let X be the set of factors of a particular positive integer m and let the relation R be divides relation. Draw the hasse diagram for the above poset for m=12. From the Hasse diagram, find out the maximal and minimal element. 5

(b) Check the validity of the following argument "If I try and I have a talent, then I will become scientist If I become scientist, then I will be happy. Therefore If I will not be happy then I did not try hard or I do not have talent." 5

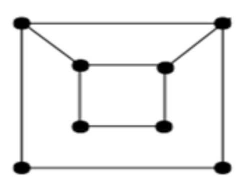
4. (a) Determine whether C_6 and K_3 graph are bipartite graph?Are the graphs G and H displayed in figure below bipartite? 3

(b) Explain Breadth First Search and Depth First Search with an example 5

(c) Check whether the two graphs G1 and G2 are isomorphic or not. 2



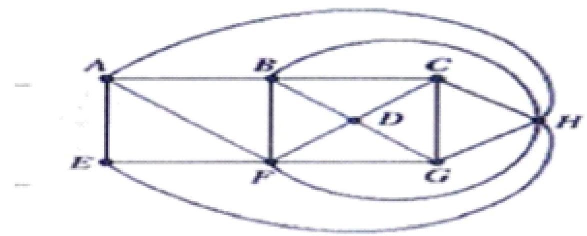
G_1



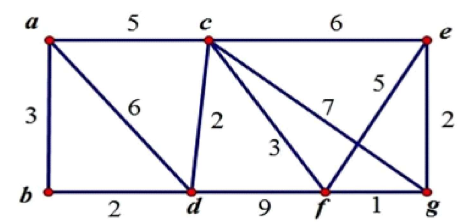
G_2

5. (a) Proof that if G is a simple graph with n vertices and k components has almost $\frac{(n-k)(n-k+1)}{2}$ edges. 4

(b) Use the Welsh- Power algorithm to determine a vertex coloring for the graph. Also, show the trace of the vertex colouring. Whether Welsh Power algorithm always give anexact solution. If not, give a reason for your answer. 5+1



6. (a) Find the shortest path from a to g by Dijkstra's Shortest Path Algorithm. 5



(b) What do you mean by Matching in a graph? Find any two edge covering and vertex covering of the following graph? 5