National Institute of Technology [illegible]

Department of Computer Science and Engineering

Combinatorics and Graph Theory (CSPE32)

Cycle Test 2, Date: 02-11-2023

Duration: 1 Hour B.Tech [CSE] Academic Year 2023-24, I Semester Max marks: 20

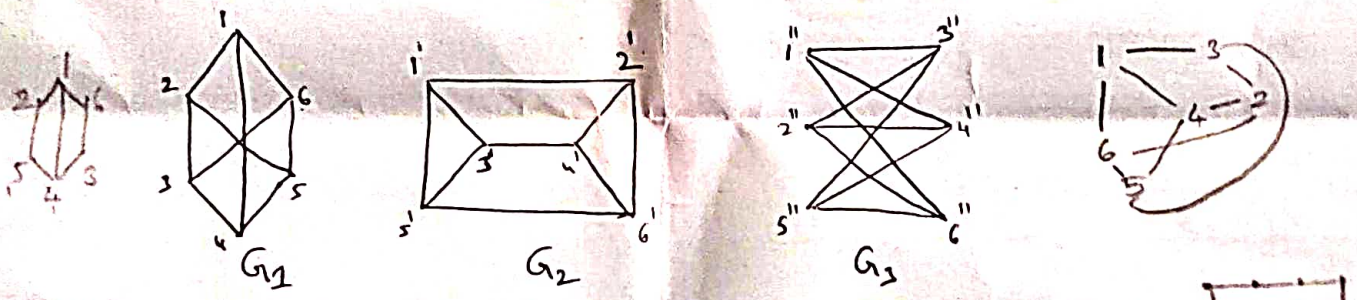
1. Define component and forest.
   (a) Determine the number of components in a forest with 9 vertices and 6 edges.
   (b) Determine the number of edges in a forest with 6 vertices and 2 components. (1+1)

2. Define the radius, diameter and center of a graph.
   (a) Calculate the difference between the diameter and radius of a cycle graph C_n.
   (b) Determine the center of a complete graph with 5 vertices. (1+1)

3. Define dual and self-dual.
   (a) Check whether the wheel graph with 5 vertices is self-dual or not.
   (b) Let the graph G contain 2 regions. How many regions exist in the dual of it? (1+1)

4. Define degree sequence.
   (a) Verify whether the sequence (6,6,5,4,3,3,1) is a valid degree sequence or not.
   (b) Verify whether the sequence (6,5,5,4,3,3,2,2,2) is a valid degree sequence or not. (1+1)

5. (a) Determine which of the following graphs are isomorphic. Justify your answer.

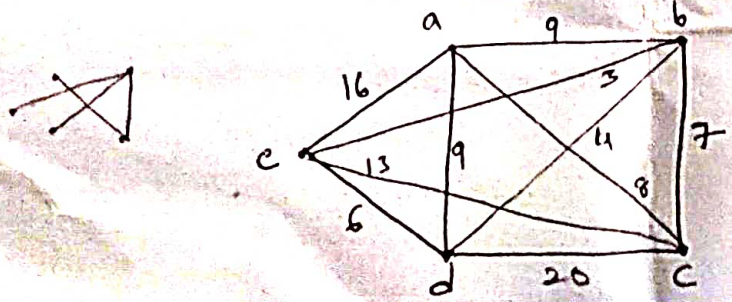


   (b) How many non-isomorphic graphs are possible with 8 vertices, 8 edges and each vertex of degree 2.

   (c) Let C_n be a self-complementary graph. What is the maximum possible value of n?

   (d) List necessary conditions and sufficient conditions for two graphs G and H to be isomorphic. (2+2+2+2)

6. Define the spanning tree of a graph.
   (a) Write Kruskal's algorithm.
   (b) Apply the above algorithm on the following graph and determine the result. (2+2)



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