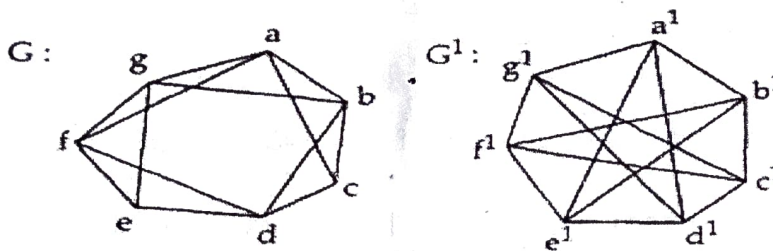**Maximum Marks 30**

Attempt any <u>five</u> questions –

1.

    a. Discuss the **Königsberg** bridge problem. **(2)**

    b. Show that the graphs G and G' are isomorphic- **(2)**

    c. "The number of vertices of odd degree in a graph is even". Prove **(2)**

2. Suppose that in a group of 5 people: A, B, C, D, and E, the following pairs of people are acquainted with each other. **(2X3=6)**

    • A and C   • A and D   • B and C   • C and D   • C and E

    a. Draw a graph G to represent this situation.
    b. List the vertex set, and the edge set, using set notation. In other words, show sets V and E for the vertices and edges, respectively, in G = {V, E}.
    c. Draw an adjacency matrix for G.

3.

    a. Draw a 4-regular graph on 6 vertices. **(2)**

    b. The graph shows the communication channels and the communication time delays in the channels among eight communication centers. The centers are represented by vertices, the channels are represented by edges and the communication time delay (in minutes) in each channel is represented by the weight of the edge. Suppose that at 3:00 p.m. communication center 'a' broadcasts through all its channels the news that someone has found a better way to build a mouse trap. Other communication centers will then broadcast this news through all their channels as soon as they receive it. For the communication center b,c,d,e,f,g and h ,determine the earliest time it recieves the news. **(4)**

4.
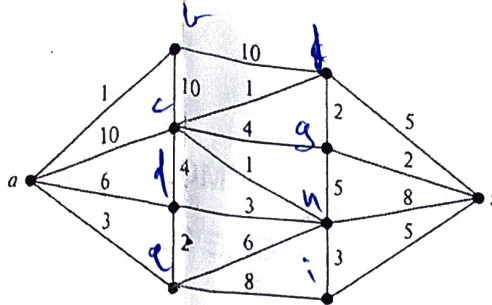
a. Is K₆ a planar graph. Justify your answer. **(2)**

b. Can a simple graph exist with 15 vertices, with each of degree five? Justify your answer. **(2)**

c. What is the complement of the given graph? **(2)**

5.
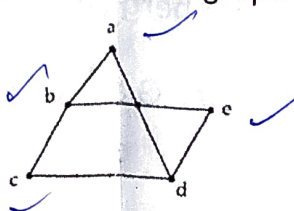
a. Perform a breadth-first search of the following graph, where A is the starting node.

b. Perform a depth-first search of the following graph, where A is the starting node.

Draw the resulting tree after BFS and DFS run **(2X3=6)**

6.
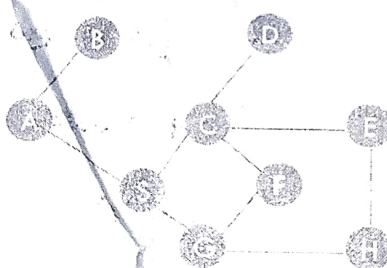
a. What is the minimum number of colours needed to colour the graphs shown below – **(2X3=6)**
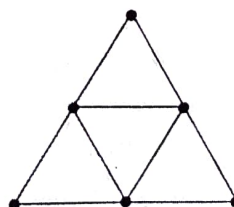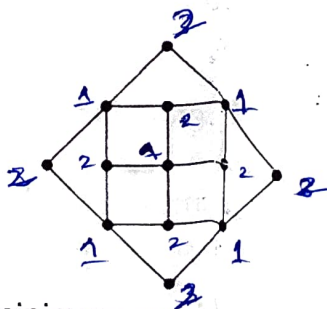
b. Determine the minimum spanning tree for the following graph –