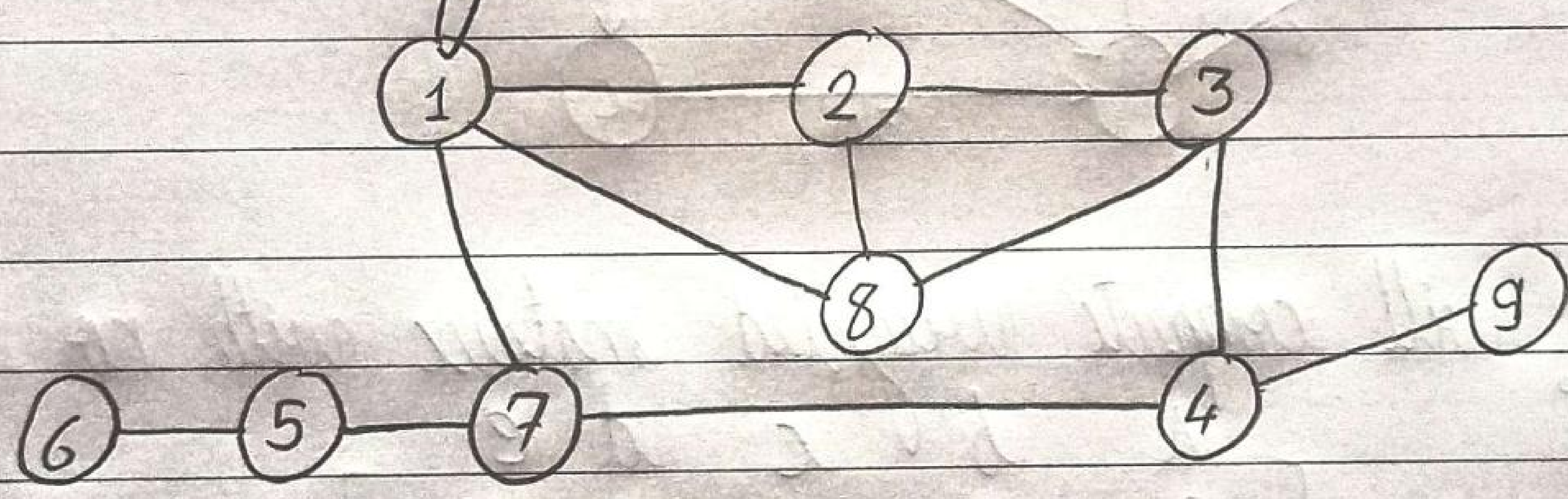
* Data Structures and Algorithms (DSA) - Assignment Number - 3

Name:- Kaustubh Shrikant Kabra.
Class:- Second Year Engineering
Div:- A Roll Number:-
Batch:-
Department:- Computer Department.
College:- AISSMS's IOIT.

Q-1. Define DFS and BFS for a graph. Show DFS and BFS for the following graph with starting vertex as 1.



→ Depth First Search (DFS)-
In depth first search traversal, we start from one vertex and traverse the path as deeply as we can go when there is no vertex further, we traverse back and search for unvisited vertex.

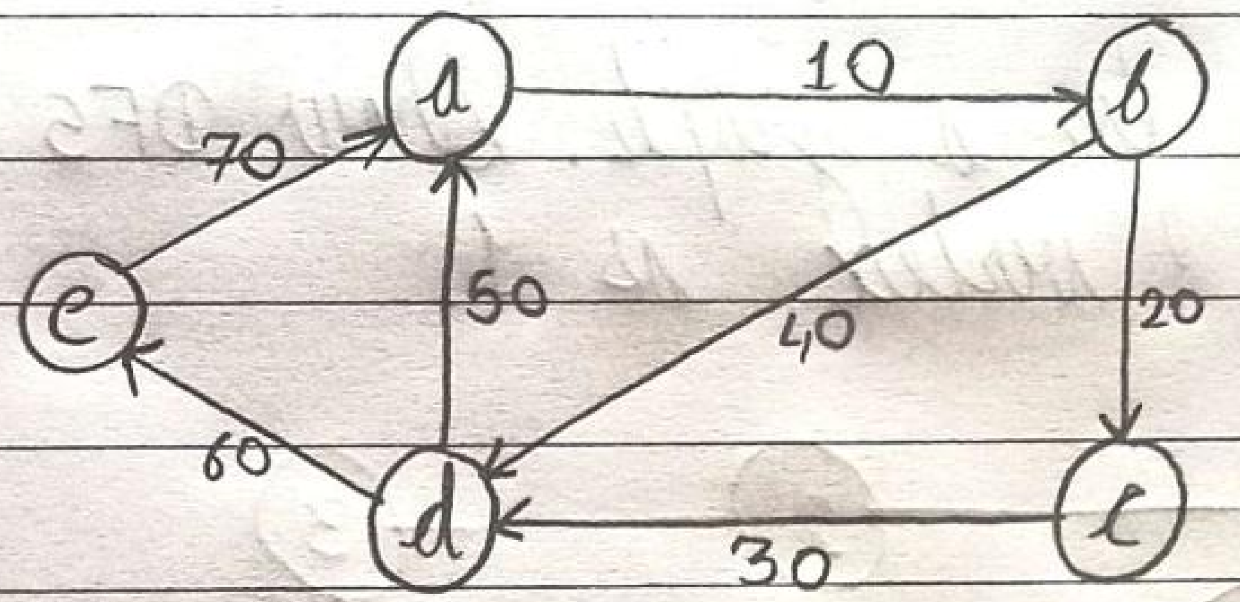
DFS for above graph - 1, 2, 3, 4, 7, 5, 6, 9, 8.

Breadth First Search (BFS) -

In breadth first search, we start from some vertex and find all the adjacent vertices of it. This process will be repeated for all the vertices so that the vertices lying on same breadth get printed.

BFS for above graph - 1, 2, 7, 8, 3, 4, 5, 9, 6.

Q - 2. Solve all pair shortest path problem using diagraph.



→ First we will compute weighted matrix with no intermediate vertex i.e. D^0.

$$D^0 = \begin{array}{c} \begin{array}{ccccc} a & b & c & d & e \end{array} \\ \begin{bmatrix} 0 & 0 & \infty & \infty & \infty \\ \infty & 0 & 20 & 40 & \infty \\ \infty & \infty & 0 & 30 & \infty \\ 50 & \infty & \infty & 0 & 60 \\ 70 & \infty & \infty & \infty & 0 \end{bmatrix} \end{array}$$

While computing D^k in each matrix D^k is the shortest distance d_{ij} has to be computed between vertices V_i and V_j where intermediate vertex is k.

$$D[i, j] = \min [D(i, j), D(i, k) + D(k, j)]$$

$$D^1 = \begin{array}{cc} & \begin{array}{ccccc} a & b & c & d & e \end{array} \\ \begin{array}{c} a \\ b \\ c \\ d \\ e \end{array} & \begin{bmatrix} 0 & 10 & \infty & \infty & \infty \\ \infty & 0 & 20 & 40 & \infty \\ \infty & \infty & 0 & 30 & \infty \\ 50 & 60 & \infty & 0 & 60 \\ 70 & 80 & \infty & \infty & 0 \end{bmatrix} \end{array}$$

$$D^2 = \begin{array}{cc} & \begin{array}{ccccc} a & b & c & d & e \end{array} \\ \begin{array}{c} a \\ b \\ c \\ d \\ e \end{array} & \begin{bmatrix} 0 & 10 & 30 & 60 & \infty \\ \infty & 0 & 20 & 40 & \infty \\ \infty & \infty & 0 & 30 & \infty \\ 50 & 60 & 20 & 0 & 60 \\ 70 & 80 & 100 & 120 & 0 \end{bmatrix} \end{array}$$

$$D^3 = \begin{array}{cc} & \begin{array}{ccccc} a & b & c & d & e \end{array} \\ \begin{array}{c} a \\ b \\ c \\ d \\ e \end{array} & \begin{bmatrix} 0 & 10 & 30 & 60 & \infty \\ \infty & 0 & 20 & 40 & \infty \\ \infty & \infty & 0 & 30 & \infty \\ 50 & 60 & 20 & 0 & 60 \\ 70 & 80 & 100 & 120 & 0 \end{bmatrix} \end{array}$$

$$D^4 = \begin{array}{cc} & \begin{array}{ccccc} a & b & c & d & e \end{array} \\ \begin{array}{c} a \\ b \\ c \\ d \\ e \end{array} & \begin{bmatrix} 0 & 10 & 30 & 60 & 120 \\ \infty & 0 & 20 & 40 & 100 \\ \infty & 90 & 0 & 30 & 90 \\ 50 & 60 & 80 & 0 & 60 \\ 70 & 80 & 100 & 120 & 0 \end{bmatrix} \end{array}$$

∴ The above matrix shows all pair shortest path.