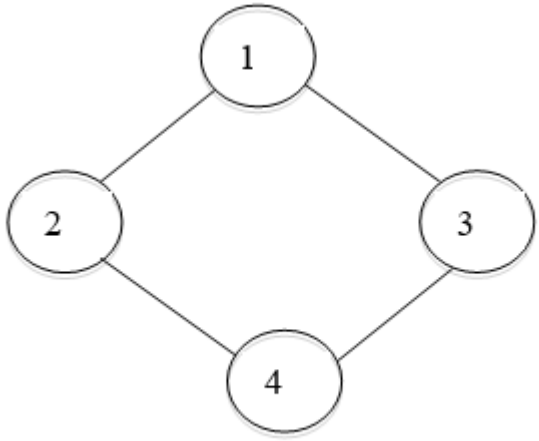
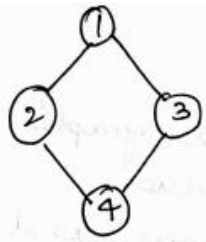
Internal Assessment Test 3 – Dec-2020									
Sub:	Data Structures and Applications					Sub Code:	18CS32	Branch:	CSE
Date:	11/12/2020	Duration:	90 mins	Max Marks:	50	Sem/ Sec:	3rd C		OBE

Answer any FIVE FULL Questions	MARKS	CO	RBT
1. Explain DFS and BFS for the following diagram with their respective algorithm 	[10]	CO4	L3

Answer:

Q1)



Depth First Search (DFS)

Step 1: Start by putting any one of the graph's vertices on top of the stack.

Step 2: Take the top item of the stack and add it to the visited list.

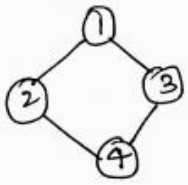
Step 3: Create a list of that vertex's adjacent nodes. Add the ones that are not in the visited list to the top of the stack.

Step 4: Keep ~~repeated~~ repeating step 2 and 3 until the stack is empty.

Stack	adj (s[top])	Nodes visited	Pop
1	—	1	—
1	2	1, 2	—
1, 2	4	1, 2, 4	—
1, 2, 4	3	1, 2, 4, 3	—
1, 2, 4, 3	—	1, 2, 4, 3	3
1, 2, 4	—	1, 2, 4, 3	4
1, 2	—	1, 2, 4, 3	2
1		1, 2, 4, 3	1
—	—	1, 2, 4, 3	

Ans : 1, 2, 4, 3

(2) Breadth First Search (BFS)



Step 1 : Start by putting any one of the graph's vertices at the back of a queue.

Step 2 : Take the front item of the queue and add it to the visited list.

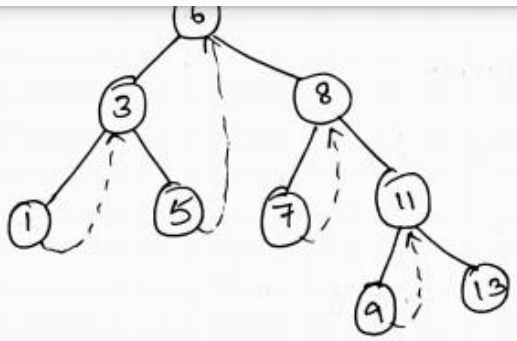
Step 3 : Create a list of that vertex's adjacent nodes. Add the ones which aren't in the visited list to the back of the queue.

Step 4 : Keep repeated steps 2 and 3 until the queue is empty.

Element (u)	Adj (u)	Nodes visited	Queue
		1	1
1	2, 3	1, 2, 3	2, 3
2	4	1, 2, 3, 4	3, 4
3	—	1, 2, 3, 4	4
4	—	1, 2, 3, 4	

2 Write Short Notes on Threaded Binary Trees and state the rules to construct a threaded Binary Tree	[10]	CO4	L2

- In a binary ~~tree~~ search tree, there are many nodes that have an empty ~~left~~ left child or empty right child or both.
- These fields can be utilized in such a way so that the empty left child of a node points to its inorder predecessor and empty right child of the node points to the inorder successor.
- If n is the number of nodes,
  Number of non null ~~link~~ links = n-1
  Total links = 2n
  Null links = 2n - (n-1) = n+1
  Replace these null pointers with some useful threads.



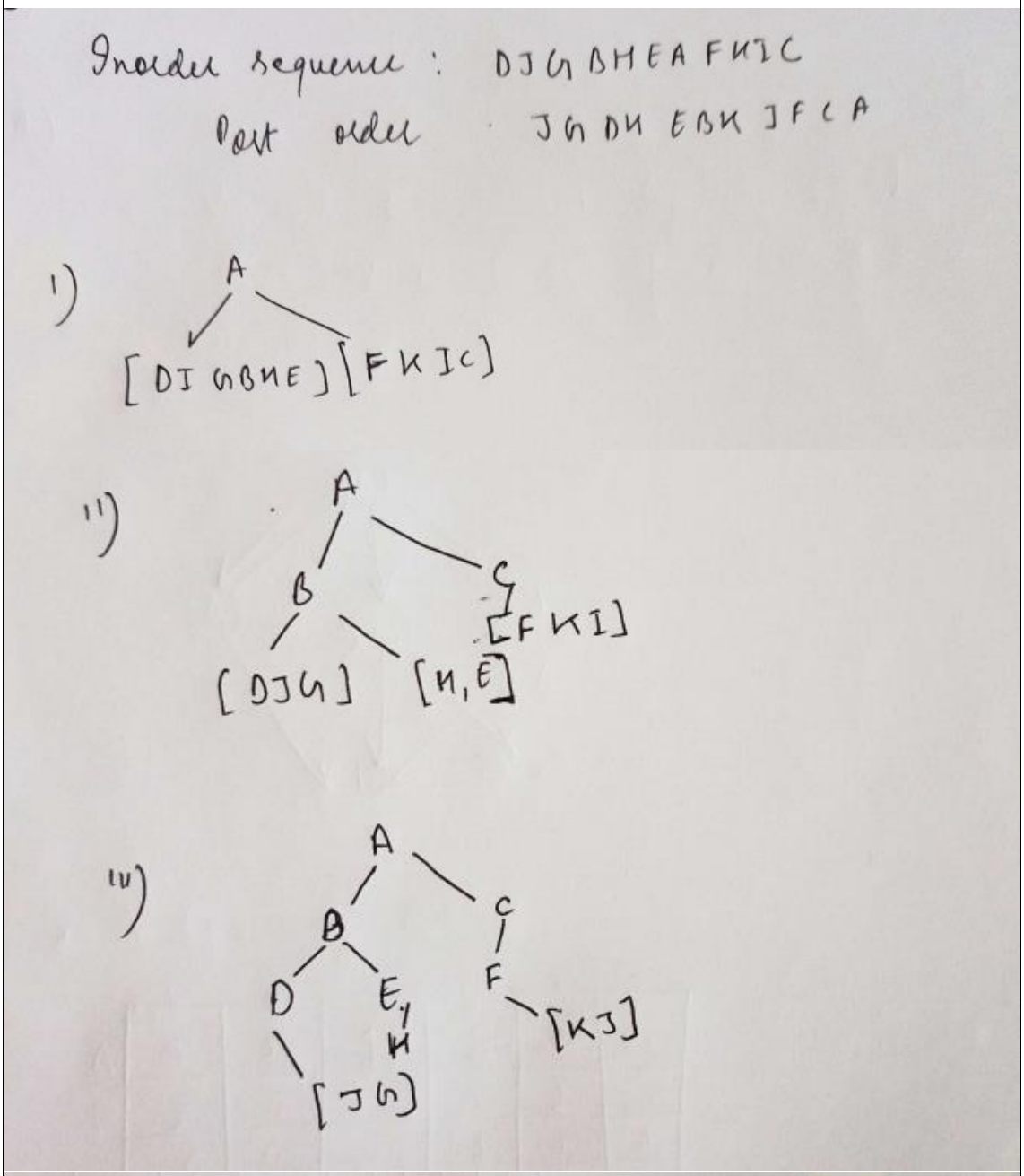
Types :

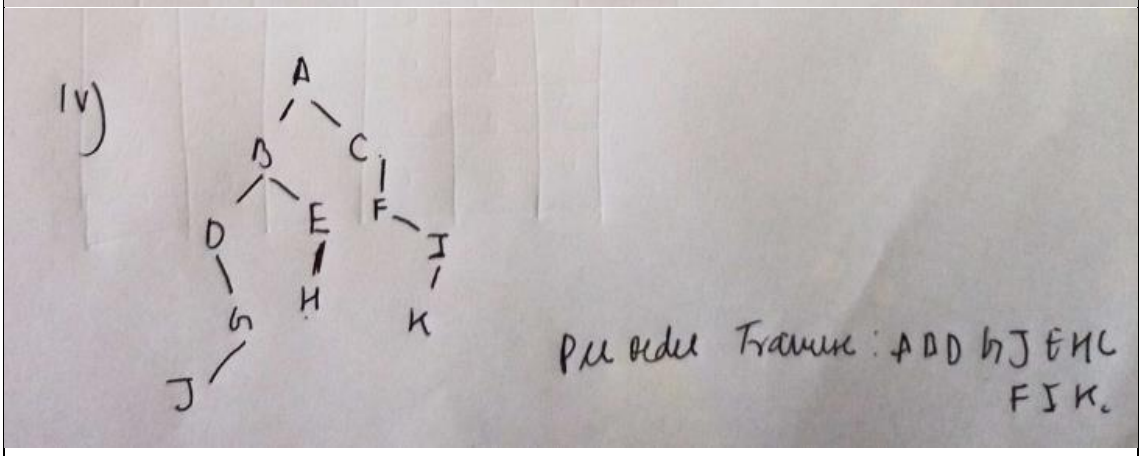
- One way threading – A thread will appear in a right field of a node and will point to the next node in the inorder traversal.
- Two way threading – A thread will also appear in the left field of a node and will point to the preceding node in the inorder traversal.

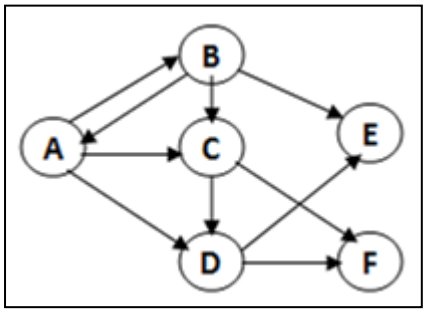
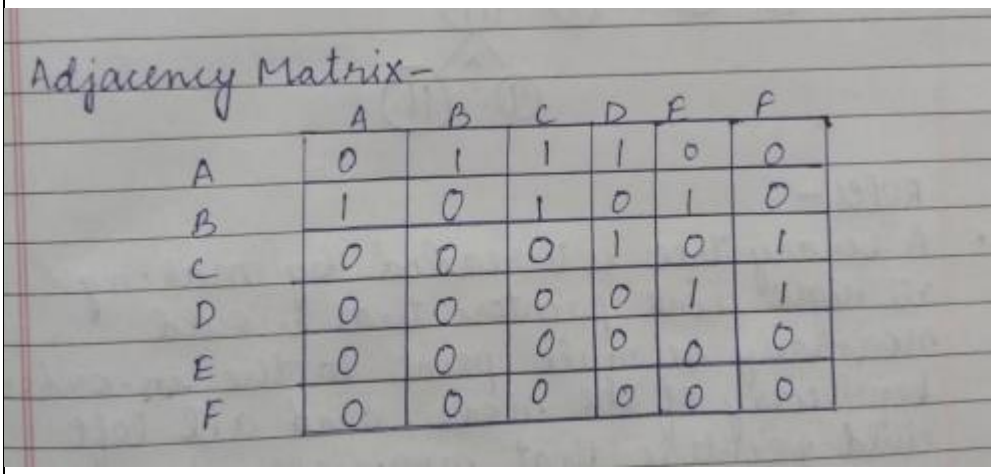
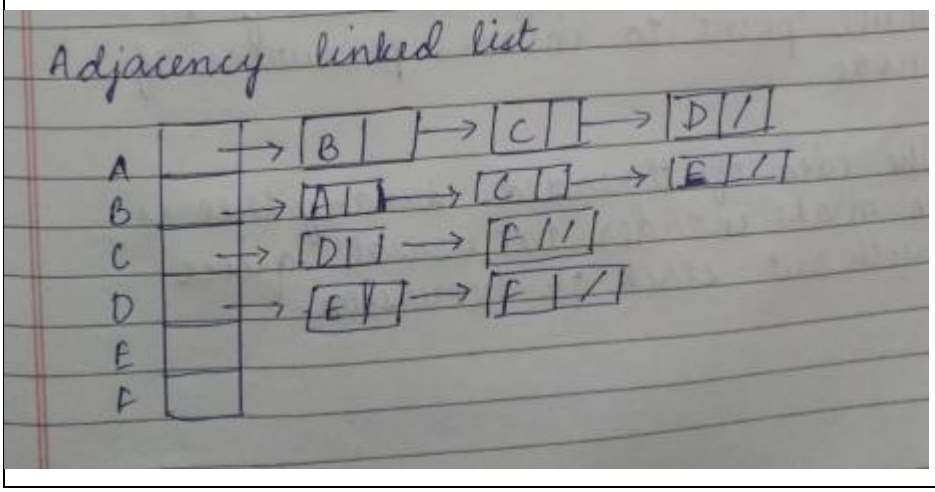
④ Rules :

1) If ptr → leftChild == NULL, we replace the null link with a pointer to the inorder predecessor of ptr
2) If ptr → rightChild == NULL, we replace the ~~null~~ null link with a pointer to the inorder successor of ptr.

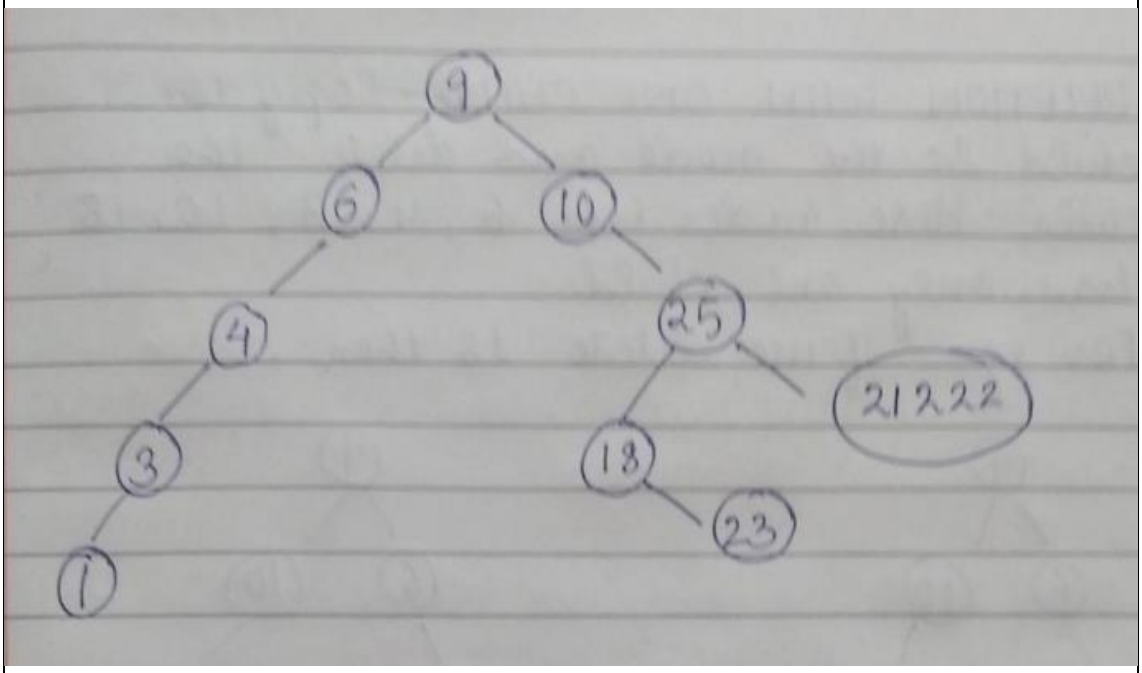
3. Given Inorder Sequence as DJGBHEAFKIC postorder sequence as JGDHEBKIFCA. Construct the binary tree and give preorder traversal	[10]	CO4	L4

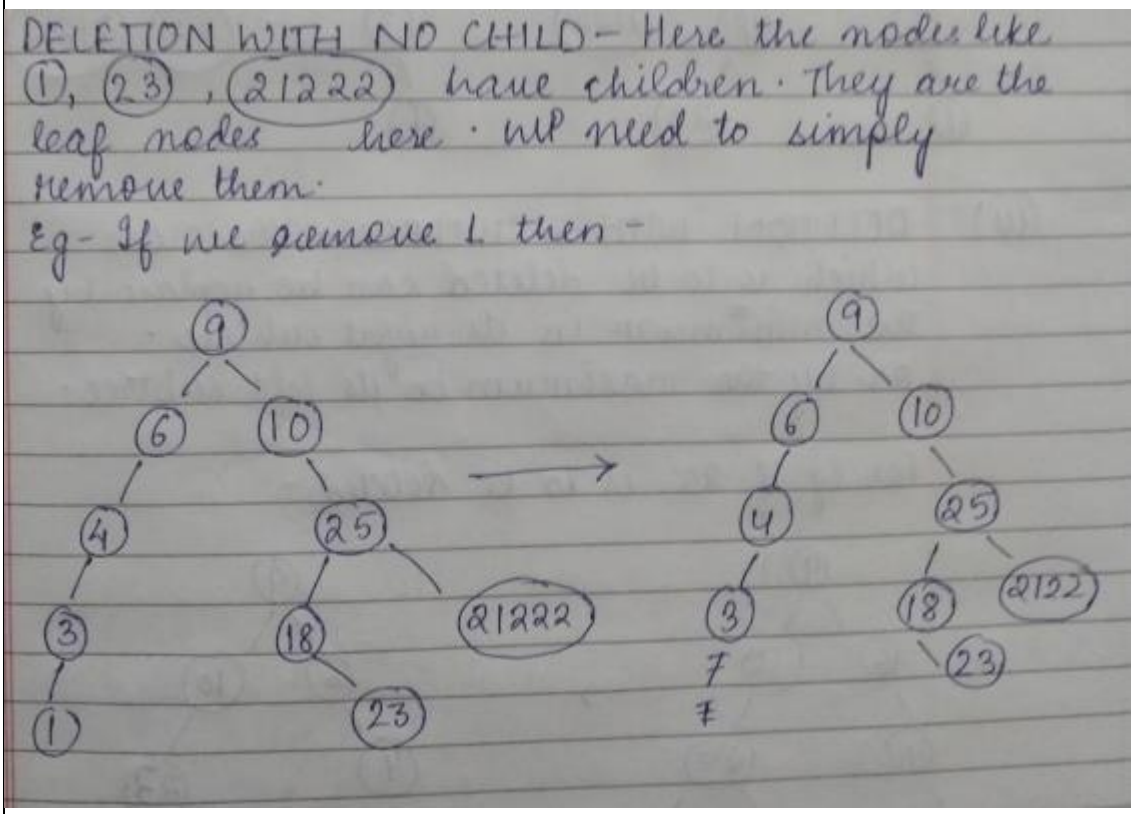




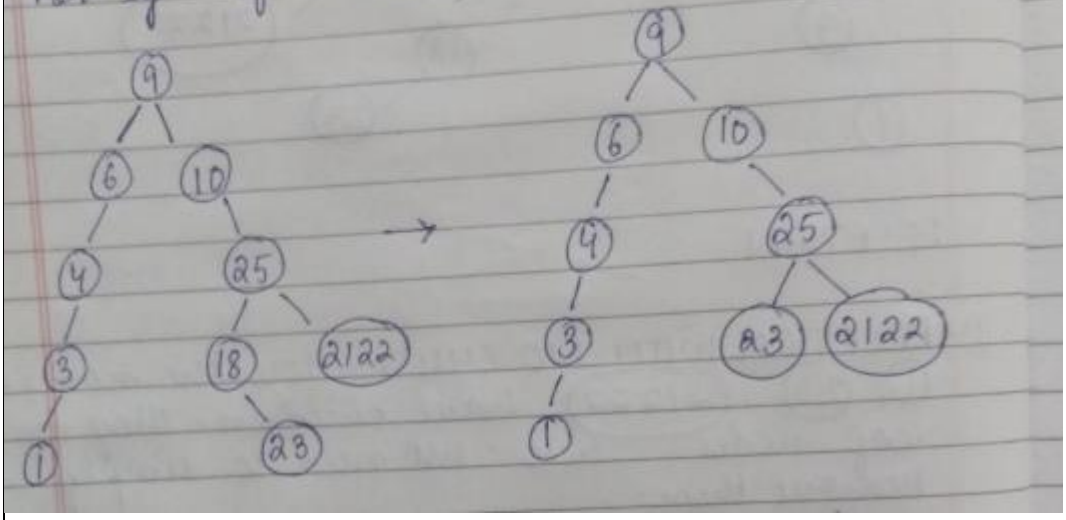
4 Define Graph. Give adjacency matrix and adjacency linked list for the given graph in the following figure.   	[10]	CO4	L3

5.a Create a Binary Search Tree with the nodes 9, 10,25,6,4,3,18,23,21222,1. With the created Tree explain the three deletion concepts of deletion with no child, one child and two children	[10]	CO4	L4



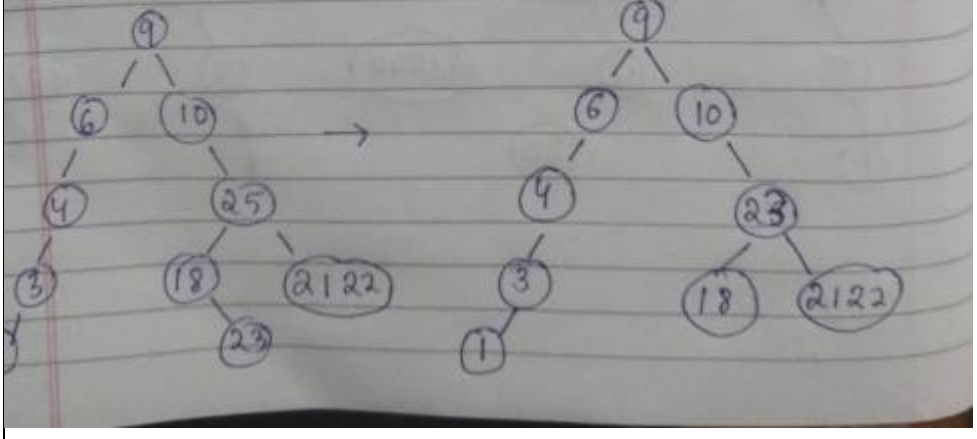


DELETION WITH ONE CHILD- Copy the child to the node and delete the child. Here nodes like 6, 4, 3, 10, 18 has only one child.
For eg- If we delete 18 then,



DELETION WITH 2 CHILDREN- The node which is to be deleted can be replace by the minimum in its right subtree.
or by the maximum in its left subtree.

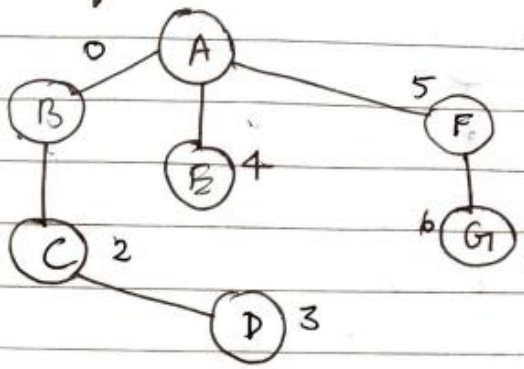
For eg if 25 is to be deleted -



6. Explain the various terminologies in a Graph with example i. Path ii. Cycles iii. Weighted graph iv. Directed Graph v. Degree	[10]	CO4	L2

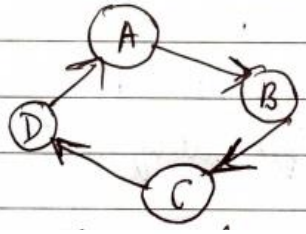
Answer:

(i) Path : It represents sequence of edges between the two vertices. In the following example ABCD also represents a path from A to D.

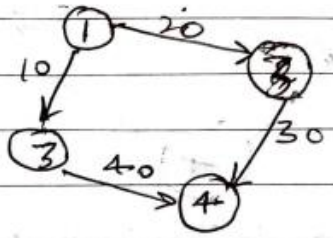


(ii) Cycle: It is a path in which the first and the last vertices are the same.

Example:



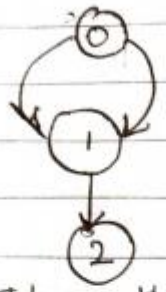
(iii) Weighted graph : A graph in which the number is assigned to each edge is called weighted graph. These are called costs or weights. The weights may represent the cost involved or length or capacity.



In the above graph, the values 10, 20, 30, 40 are the weights associated with their respective edges.

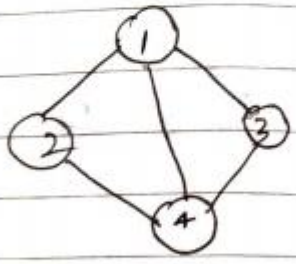
Directed graph : A graph $G=(V,E)$ in which every edge is directed is called a directed graph.

Ex: In the following graph, $G=(V,E)$ is a directed graph.



Degree : It is the number of vertices adjacent to a vertex V.

example: degree(1) = 3



example 2:

Indegree(1) = 1

Outdegree(2) = 2