University of Mumbai

Program: **Information Technology**
Curriculum Scheme: Rev 2016
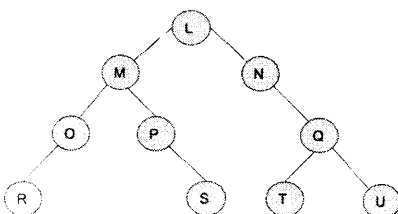Examination: SE Semester III
Course Code: ITC303 and Course Name: Data Structures & Analysis

Max. Marks: 80

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	The five items: A, B, C, D and E are pushed in a stack, one after the other starting from A. Then the stack is popped four times and each element is inserted in a queue. Then two elements are deleted from the queue and pushed back on the stack. Now one item is popped from the stack. The popped item is:
Option A:	A
Option B:	B
Option C:	C
Option D:	D
2.	What is the Postorder Traversal of a Binary tree if its Inorder traversal is KYIXJ and Preorder traversal is XYKIJ?
Option A:	KYIJX
Option B:	YKIJX
Option C:	KIYJX
Option D:	KIJYX
3.	Which of the following data structures is used for traversing in a given graph by breadth first search?
Option A:	Stack
Option B:	Set
Option C:	List
Option D:	Queue
4.	Each non root node of B Tree of order M contains ?
Option A:	At least [M/2]-1 keys and maximum M-1 keys
Option B:	Minimum 2 keys and maximum M-1 keys
Option C:	Minimum M keys and at most 2*M keys
Option D:	Exact [M/2] -1 Keys
5.	The minimum number of edges in a connected cyclic graph on n vertices is?
Option A:	n-1
Option B:	n
Option C:	n+1
Option D:	2n+1
6.	What is the height of a constructed Binary Search Tree if elements 36, 2, 15, 22, 55, 43, 88, 29 are inserted in an empty Binary Search tree as per given order?
Option A:	2

Option B:	4
Option C:	6
Option D:	3
7.	The maximum degree of any vertex in a simple graph with n vertices is?
Option A:	n
Option B:	n-1
Option C:	n+1
Option D:	2n-1
8.	What is Postfix Expression of given Infix Expression X-Y*(A+B)/C ?
Option A:	XYAB+C/*-
Option B:	XYAB+*C/-
Option C:	XYAB+C-*/
Option D:	XYAB+*C-/
9.	A binary tree in which all of the nodes are of degree zero or two but never degree one is called as _____ .
Option A:	Binary Search Tree
Option B:	Left Skewed Binary Tree
Option C:	Strictly Binary Tree
Option D:	Right Skewed Tree
10.	Which data structure is used for the application of implementation of simulation of scheduling of Limited resources?
Option A:	Stack
Option B:	Queue
Option C:	Heap
Option D:	Trees

Q2	Total 20 marks.
Q2A	Solve any Two, 5 marks each, total 10 marks.
i.	Explain the Insertion sort algorithm, along with example.
ii.	Write Inorder Traversal, Preorder Traversal and Postorder Traversal sequence for given binary tree by giving its algorithm. Figure 1. Binary Tree
iii.	Solve stepwise, to convert the following Infix expression to Posifix notation. (x*y)+(z+((a+b-c)*d))- i*(j/k)

Q2B	Solve any One, 10 marks each, total 10 marks.
i.	Explain what is a Singly linked list along with its operations: traversing, searching, insertion and deletion. Proper diagrammatic representations of operations on the linked list, as mentioned above, are also expected. Also, write two real world applications of the linked list.
ii.	What is an AVL Tree? Construct an AVL tree for the following dataset: 33, 38, 42, 21, 16, 26, 40, 30, 27, 22, 14, 15, 19 Mention the rotations, if any, at each step.

Q3	Total 20 marks.
Q3A	Solve any Two, 5 marks each, total 10 marks.
i.	Construct binary search tree for given sequence 50, 70, 60, 20, 90, 10, 40, 100, 65, 25, 87.
ii.	Sort following array of eight integers using quicksort. Show stepwise status of array. 2 5 1 7 9 12 11 10
iii.	Compare BFS and DFS Graph traversal algorithms.
Q3B	Solve any One, 10 marks each, total 10 marks.
i.	What are the methods to resolve collision in hashing? Arrange following values in Hash table using Separate chaining. Use hash function h(k)=k mod 7. 29, 100, 54, 67, 34,42,90,56, 78,12, 29
ii.	What are data structures? Explain linear and non-linear data structures with example.

Q4	Total 20 marks.
Q4A	Solve any Two, 5 marks each, total 10 marks.
i.	Generate a Huffman Tree for the string **CBAAFFACFB**. At the end specify the Huffman code for each character in the given string. Specify how much memory bits are saved from the original, if 8 bits per character are required to store the string in original format.
ii.	Write an algorithm/ pseudo code for Selection sort. Explain working by taking suitable example.
iii.	Explain Threaded Binary Tree with suitable example.
Q4B	Solve any One, 10 marks each, total 10 marks.
i.	Explain the working of the double ended queue with its operations: insert, delete, display, empty, and full. Proper diagrammatic representations of operations as mentioned above, are also expected.

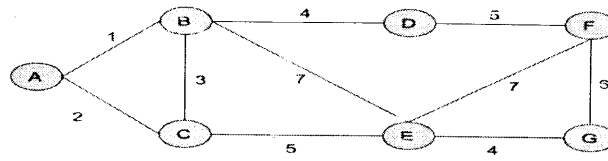| ii.	Write Prim's algorithm and Kruskal's algorithm to find Minimum Spanning Tree (MST). Also for the given graph below, find the MST using Prim's algorithm and Kruskal's algorithm, both. Specify the cost at each step, and total weight.

Figure 2. Graph