University of Mumbai

Program: **Information Technology**
Curriculum Scheme: Rev 2019
Examination: SE Semester III
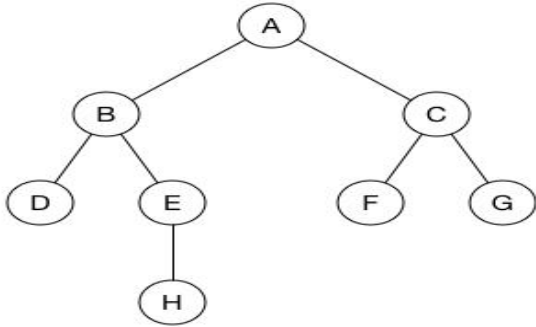Course Code: ITC302 and Course Name: Data Structure and Analysis
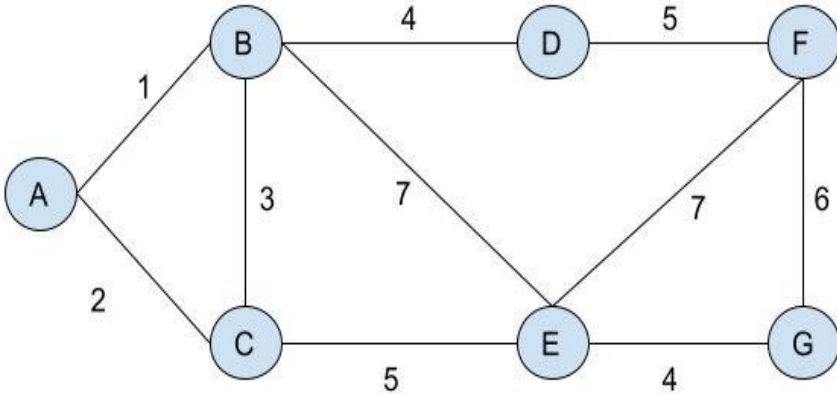
Time: 2 hour   Max. Marks: 80

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks (2marks X 10 =20 marks)
1.	Stack cannot be used to?
Option A:	Evaluate an arithmetic expression in postfix form
Option B:	Implement recursion
Option C:	Convert a given arithmetic expression infix form to its equivalent postfix form
Option D:	Allocate resources (like CPU) by the operating system
2.	The following sequence of operations is performed on a stack push(1), push(2), pop, push(1), push(2), pop, pop, pop, push(2), pop. The sequence of the popped out values is
Option A:	2, 2, 1, 1, 2
Option B:	2, 2, 1, 2, 2
Option C:	**2, 2, 1, 2, 2**
Option D:	2, 1, 2, 2, 2
3.	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
4.	Which of the following is an advantage of balanced binary search tree, like AVL tree, compared to binary heap?
Option A:	insertion takes less time
Option B:	deletion takes less time
Option C:	searching takes less time
Option D:	construction of the tree takes less time than binary heap
5.	An adjacency matrix representation of graph cannot contain information of:
Option A:	Nodes
Option B:	Edges
Option C:	Direction of edges
Option D:	Parallel Edges

6.	The maximum degree of any vertex in a simple graph with n vertices is
Option A:	n-1
Option B:	n+1
Option C:	2n-1
Option D:	n
7.	What is average time complexity of quick sort?
Option A:	$O(n^2)$
Option B:	$O(n)$
Option C:	$O(nlogn)$
Option D:	$O(logn)$
8.	Calculate the number of collisions for storing the following keys using hash function h(k)=k % 13 13,39,42,57,100
Option A:	0
Option B:	1
Option C:	2
Option D:	3
9.	Consider the case where main() function calls f1(), f1() calls f2(), later f2() calls f1() and this goes on till the terminating condition, such a case is called as?
Option A:	Direct recursion
Option B:	Unwinding phase of the recursion
Option C:	Indirect recursion
Option D:	Tail recursion
10.	Which of the methods traverses the free block list and allocates a memory block, from the free blocks, that is largest in size?
Option A:	Free fit
Option B:	First fit
Option C:	Best fit
Option D:	Worst fit

Q2	**Solve any Two Questions out of Three**	**10 marks each**
i	Explain the Merge sort algorithm, along with a working example.	
ii	Write Inorder Traversal, Preorder Traversal and Postorder Traversal sequence for given binary tree by giving its algorithm.	
iii	Solve stepwise, to convert the following Infix expression to Prefix notation. (A+B)*(C+D)$(A+B)	

Q3	**Solve any Two Questions out of Three**	**10 marks each**
i	Explain what is a Circular linked list along with its operations: traversing, searching, insertion and deletion. Proper diagrammatic representations are also expected. Also, write two real world applications of it.	
ii	With example, explain how the Binary Buddy System in the storage management allocates free memory blocks upon request and keeps track of free blocks after the process frees allocated memory block.	
iii	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.	

Q4	Solve any Two Questions out of Three	10 marks each
i	Generate a Huffman Tree for the string **BBAEDAFCBA**. 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	What Collision in hashing with an example? Explain the methods to resolve collision. What is Linear Probing with an example?	
iii	Explain the working of Queue with its operations: insert, delete, display, empty , full. Proper diagrammatic representations of operations as mentioned above, are also expected. Also, write two applications (algorithms) where queue data structure is used.	