University of Mumbai

Examination 2020 under cluster 7(Lead College: SSJCOE)

Examinations Commencing from 7th January 2021 to 20th January 2021

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

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Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	In the worst case the time required to search an element in a linked list of length n is?
Option A:	O(n)
Option B:	O(log2 n)
Option C:	O(1)
Option D:	O(n2)
2.	Consider a linked list of n elements which is pointed by an external pointer. What is the time taken to delete the element which is the successor of the element pointed to by a given pointer?
Option A:	O(1)
Option B:	O(log2 n)
Option C:	O(n)
Option D:	O(n log2 n)
3.	Which of the following operations is performed more efficiently by a linear doubly linked list than by a linear singly linked list?
Option A:	Deleting a node whose location is given
Option B:	Searching an unsorted list for a given item
Option C:	Inserting a node after a node with a given location
Option D:	Traversing the list to process each node
4.	A linear list in which the elements can be added or removed at either end but not in the middle is called as?
Option A:	queue
Option B:	dequeue
Option C:	stack
Option D:	tree
5.	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

6.	What is the height of a constructed Binary Search Tree if elements 48, 22, 27, 30, 96, 74, 88, 35 are inserted in an empty Binary Search tree as per given order?
Option A:	6
Option B:	3
Option C:	2
Option D:	4
7.	What is the Postorder Traversal of a Binary tree if its Inorder traversal is OMPLN and Preorder traversal is LMOPN?
Option A:	OPMNL
Option B:	OMPNL
Option C:	PMONL
Option D:	NPMOL
8.	What is the node structure for Threaded Binary Tree?

Option A:	struct node
	{
	struct node * LeftChild;
	bool Left_Tag;
	struct node * RightChild;
	bool Left_Tag;
	};

Option B:	struct node
	{
	struct node * RightChild;
	bool Left_Tag;
	};

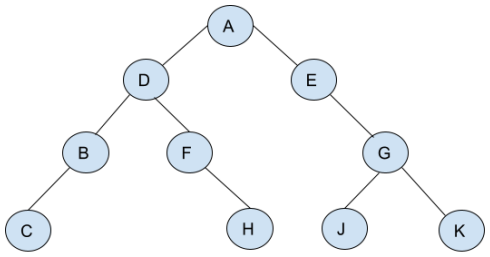
Option C:	struct node
	{
	struct node * LeftChild;
	bool Left_Tag;
	};

Option D:	struct node
	{
	struct node * LeftChild;
	bool Tag;
	struct node * RightChild;
	};

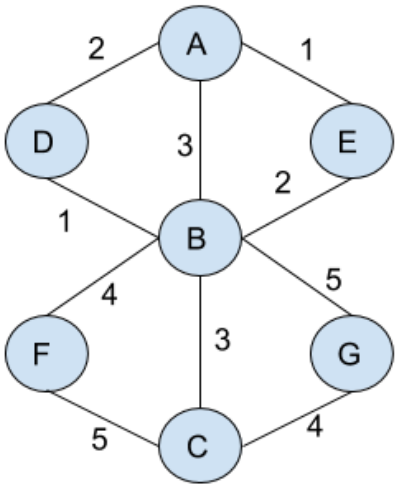
9.	Number of vertices in a graph of odd degree is?
Option A:	always even
Option B:	always odd
Option C:	either even or odd
Option D:	always zero
10.	The terminal vertices of a path are of a degree?
Option A:	one
Option B:	two
Option C:	zero
Option D:	more than four

11.	A simple graph with n vertices and k components can have at most
Option A:	n edges
Option B:	n-k edges
Option C:	(n-k)(n-k-1)/2 edges
Option D:	(n-k)(n-k+1)/2 edges
12.	In recursion, the unwinding phase starts when?
Option A:	The first call to the recursive function is made by main()
Option B:	The first call to itself by the recursive function
Option C:	The terminating condition becomes true in the recursive function
Option D:	The control is returned back to the main() from the recursive function
13.	Which of the following methods will not suffer from the fragmentation?
Option A:	Allocating the first free block that is large enough to fulfill the request
Option B:	Traversing the whole free memory list and allocating the block which is closest in size of memory requested
Option C:	Allocating the free block equal in size as required by the process
Option D:	Allocating the block in the multiple of fixed size
14.	Which of the methods traverses the whole free block list and allocates a memory block of size equal to or slight more than required by the process?
Option A:	Free fit
Option B:	First fit
Option C:	Best fit
Option D:	Worst fit
15.	In the worst case of the binary search algorithm, how many comparisons will be made, if the data set contains N elements?
Option A:	1
Option B:	N Log_2N
Option C:	Log_2N
Option D:	N
16.	If the data set is {123, 12, 23, 22, 54, 56, 45}, and storage size is 10 where indexing starts from 0 then in hashing by "folding method", how many collisions will occur? Fold the number using the sum of digits till it becomes a singular digit.
Option A:	0
Option B:	1
Option C:	2
Option D:	3
17.	If the data set is {123, 12, 23, 22, 54, 56, 45}, after the first iteration what will be the updated data set in the insertion sort algorithm?
Option A:	{12, 23, 22, 45, 54, 56, 123}
Option B:	{12, 23, 22, 54, 56, 45, 123}
Option C:	{12, 22, 23, 45, 54, 56, 123}
Option D:	{12, 23, 22, 45, 56, 54, 123}

18.	What is Postfix Expression of given Infix Expression L+(M*(N-O)/P) ?
Option A:	LMNO-*P/+
Option B:	LMNO-P/*+
Option C:	LMNOP-/*+
Option D:	LMNO-/P*+
19.	Element with the largest key in Max-Heap is always present in which node of it?
Option A:	At Left Child of root node
Option B:	At Leaf Node
Option C:	At Right child of root node
Option D:	At Root Node
20.	Let G be a connected undirected graph with 200 vertices and 400 edges. The weight of the Minimum Spanning Tree of G is 800. When the weight of each edge of G is increased by eight, the weight of a Minimum Spanning Tree will be:
Option A:	3200
Option B:	1600
Option C:	2392
Option D:	1392

Q2	**Total 20 marks.**
Q2A	**Solve any Two, 5 marks each, total 10 marks.**
i.	Explain the insertion 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.	Write an algorithm to convert an arithmetic expression 'I' written in infix notation into its equivalent postfix expression 'P'.
Q2B	**Solve any One, 10 marks each, total 10 marks.**
i.	Explain what is a Doubly linked list along with its operations: traversing, searching, insertion and deletion. Proper diagrammatic representations of operations as mentioned above, are also expected. Also, write two computer world applications of the doubly linked list data structure.
ii.	What is an AVL Tree? Construct an AVL tree for the following dataset: 22, 27, 31, 10, 5, 15, 39, 19, 16, 11, 3, 4, 8 Mention the rotation, if any, at each step.

Q3	**Total 20 marks.**
Q3A	**Solve any Two, 5 marks each, total 10 marks.**

i.	Generate a Huffman Tree for the string **EBEABCCEAD**. 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.	With example, explain three sequential fit methods of storage management.
iii.	Explain Collision in hashing with an example. What are the methods to resolve collision? Explain Linear Probing with an example.
Q3B	**Solve any One, 10 marks each, total 10 marks.**
i.	Explain the working of stack with its operations: push, pop, peek, display, empty , full. Proper diagrammatic representations of operations as mentioned above, are also expected. Also, write two applications (algorithms) where stack data structure is used.
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. 

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Question Number	Correct Option (Enter either 'A' or 'B' or 'C' or 'D')
Q1.	A
Q2.	A
Q3.	A
Q4	B
Q5	C
Q6	D
Q7	A
Q8.	A
Q9.	A
Q10.	A
Q11.	D
Q12.	C
Q13.	C
Q14.	C
Q15.	C
Q16.	B
Q17.	B
Q18.	A
Q19.	D
Q20.	C