

University of Mumbai
Examination 2020 under cluster 7(Lead College: SSJCOE)

Examinations Commencing from 10th April 2021 to 17th April 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

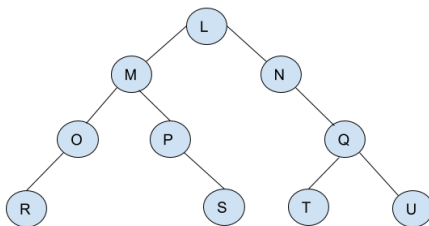
Max. Marks: 80

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	The time required to insert an element in a stack with linked list implementation is
Option A:	O(1)
Option B:	O(log ₂ n)
Option C:	O(n)
Option D:	O(n log ₂ n)
2.	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
3.	In which kind of storage structures for strings, one can easily insert, delete, concatenate and rearrange substrings?
Option A:	Fixed length storage structure
Option B:	Variable length storage with fixed maximum
Option C:	Linked list storage
Option D:	Array type storage
4.	In a circular singly linked list organization, insertion of a record involves the modification of?
Option A:	no pointer
Option B:	one pointer
Option C:	two pointers
Option D:	three pointers
5.	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:	YKIIX
Option C:	KIYJX
Option D:	KIJYX

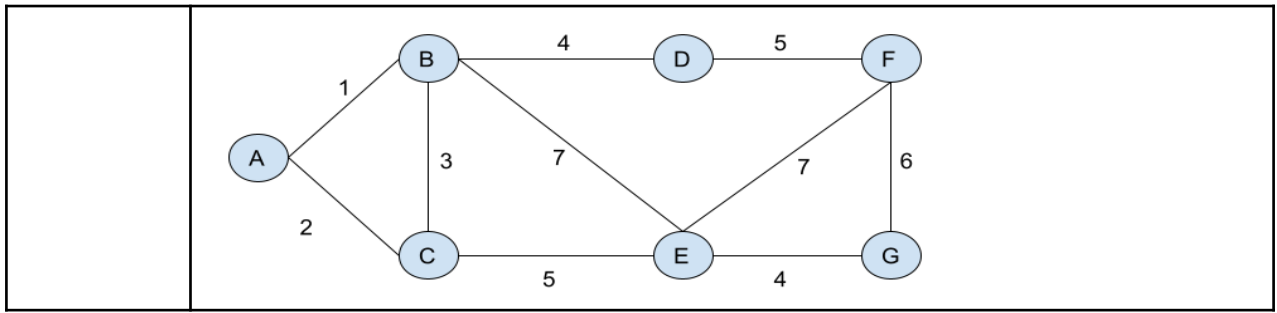
6.	Each non root node of B Tree of order M contains ?
Option A:	At least $\lceil M/2 \rceil - 1$ keys and maximum M-1 keys
Option B:	Minimum 2 keys and maximum M-1 keys
Option C:	Minimum M keys and at most 2^*M keys
Option D:	Exact $\lceil M/2 \rceil - 1$ Keys
7.	What is the height of a constructed Binary 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
8.	Which data structure provides Multilevel Indexing?
Option A:	B-Tree
Option B:	B+-Tree
Option C:	AVL Tree
Option D:	Binary Search Tree
9.	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
10.	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:	$2n-1$
11.	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:	$2n+1$
12.	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
13.	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
14.	The terminal vertices of a path are of a degree?
Option A:	one
Option B:	two
Option C:	zero
Option D:	more than four
15.	In the best case of the binary search algorithm, how many comparisons will be made, if the data set contains N data elements?
Option A:	0
Option B:	1
Option C:	N-1
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 "mid square method", how many collisions will occur? In the case of even counting digits, consider the left digit as middle.
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 merge step of the recursive merge sort algorithm, what will be the updated data set?
Option A:	{12, 23, 22, 54, 56, 45, 123}
Option B:	{12, 123, 22, 23, 54, 56, 45}
Option C:	{12, 123, 23, 22, 54, 56, 45}
Option D:	{12, 23, 22, 45, 56, 54, 123}
18.	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-/-
19.	What is the probability of finding the greatest element at the last level from a full binary min heap tree with n number of elements and every node with degree 2?
Option A:	1/n
Option B:	n
Option C:	1
Option D:	$\frac{1}{2}^n$
20.	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 selection 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 Postfix 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.	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 to add two polynomials using the linked list. Explain with an example.
iii.	Explain Collision in hashing with an example. What are the methods to resolve collision? Explain Double Hashing with an example.
Q3B	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.



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