University of Mumbai
Examination 2020 under cluster 7(Lead College: SSJCOE)
Examinations Commencing from 15th June 2021 to 24th June 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.	The time required to insert an element in a stack with linked list implementation is
Option A:	O(1)
Option B:	O(log2 n)
Option C:	O(n)
Option D:	O(n log2 n)
2.	The five items: A, B, C, D and E are pushed in a stack, one after the other starting from A. Then 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:	YKIJX
Option C:	KIYJX
Option D:	KIJYX

6.	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
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.	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
13.	Which of the methods traverses the free block list and allocates a memory block, from the free blocks list, that is found at start of the search and equal to or more than in size than required by the process?

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Option A:	Free fit
Option B:	First fit
Option C:	Best fit
Option D:	Worst fit
14.	Which of the following methods will suffer from internal 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 largest in size
Option D:	Allocating the block in the multiple of fixed size
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 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.	What is fragmentation in the storage management? What are the types of fragmentation that may occur while memory allocation/ deallocation? With example, explain how the Boundary Tag method keeps track of free memory blocks.
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 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.

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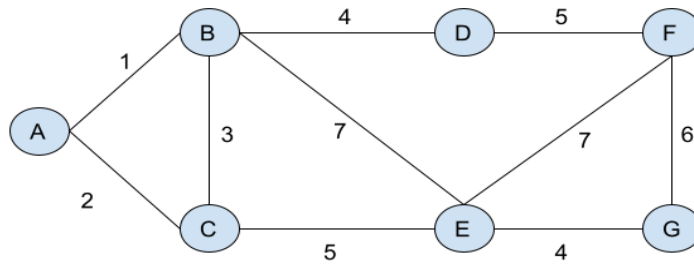
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Question Number	Correct Option (Enter either 'A' or 'B' or 'C' or 'D')
Q1.	A
Q2.	D
Q3.	C
Q4	C
Q5	C
Q6	A
Q7	B
Q8.	B
Q9.	D
Q10.	B
Q11.	B
Q12.	C
Q13.	B
Q14.	D
Q15.	B
Q16.	B
Q17.	C
Q18.	B
Q19.	C
Q20.	B