University of Mumbai

Program: **Computer Engineering** Curriculum

Scheme: Rev2019 Examination: Second Year

Semester: III

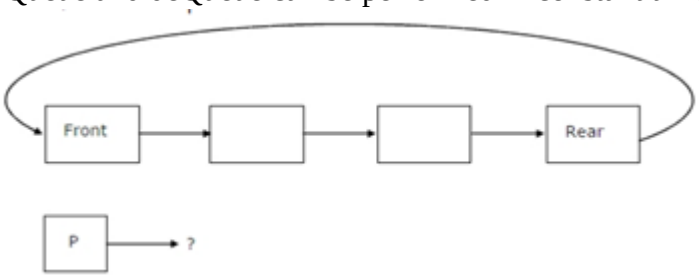
Course Code: CSC303 Course Name : Data Structures

Time: 2 hour Max. Marks: 80

Q1. All questions compulsory 2 marks each (40 Marks)

Q1.	Identify the following data structure which is an Abstract Data Type.
A	TREES
B	QUEUE
C	ARRAY
D	GRAPH

Q2	struct node
	{
	struct node *prev;
	int num;
	struct node *next;
	};
	typedef struct node NODE;
	NODE *ptr;
	In a Doubly linked list which statement is correct for dynamically allocating a memory for Node.

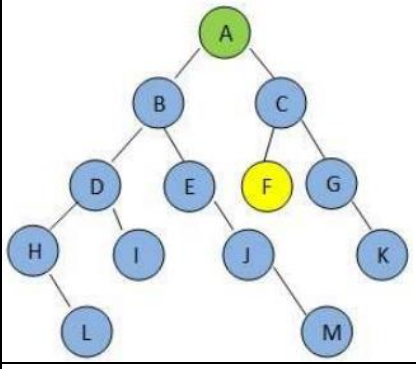
A	ptr=(NODE*)malloc(sizeof(NODE));
B	ptr=(NODE*)malloc(NODE);
C	ptr=(NODE*)malloc(sizeof(NODE*));
D	ptr=(NODE)malloc(sizeof(NODE));
Q3	A linked list in which last node of the list points to the first node of the list is _____ linked list
A	Doubly linked List
B	Circular Linked List
C	Singly Linked List
D	Linked Queue
Q4	A circularly linked list is used to represent a Queue. A single variable p is used to access the Queue. To which node should p point such that both the operations enQueue and deQueue can be performed in constant time? 
A	Rear node
B	Front node
C	Single pointer dont support
D	Node next to front

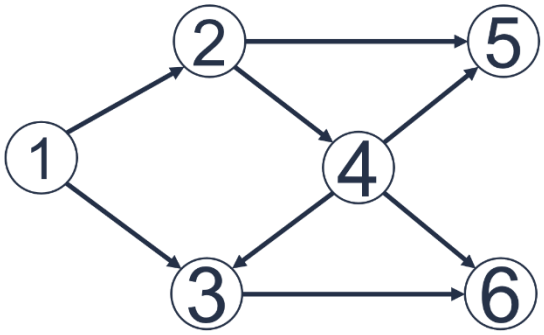
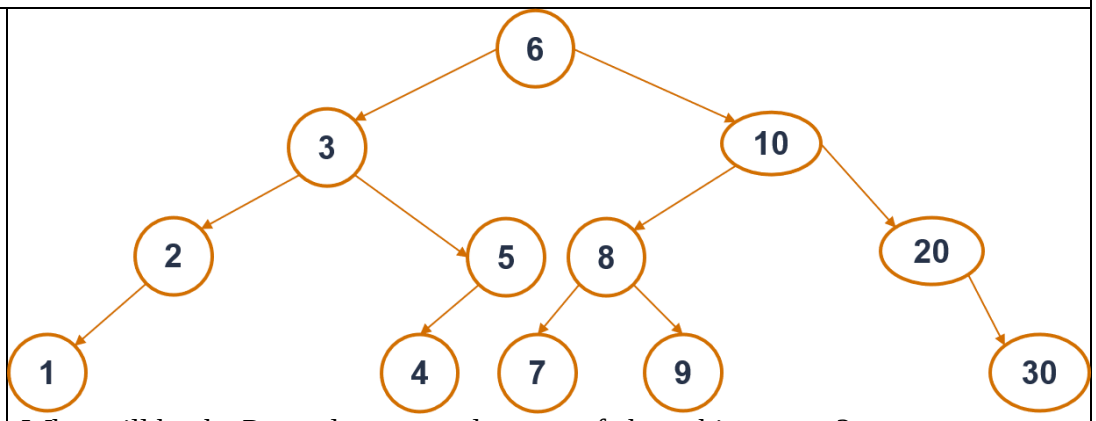
Q5	Consider the function f defined below.
	struct item {
	int data;
	struct item * next;
	};
	int f(struct item *p) {
	return ((p == NULL) || (p ->next == NULL) ||
	((p->data <= p -> next -> data) &&
	f(p-> next)));
	}
	For a given linked list p, the function f returns 1 if and only if

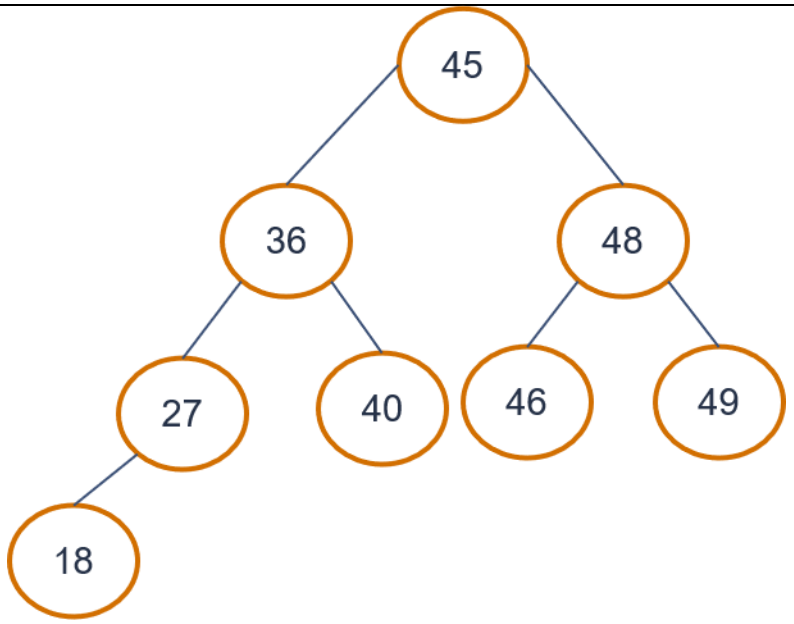
A	The list is empty or has exactly one element
B	the elements in the list are sorted in non-decreasing order of data valu
C	the elements in the list are sorted in non-increasing order of data value
D	not all elements in the list have the same data value

Q6	The following C function takes a simply-linked list as input argument. It modifies the list by moving the last element to the front of the list and returns the modified list. Some part of the code is left blank.
	typedef struct node {
	int value;
	struct node *next;
	} Node;
	Node *move_to_front(Node *head) {
	Node *p, *q;
	if ((head = = NULL: || (head->next = = NULL)) return head;
	q = NULL; p = head;
	while (p-> next !=NULL) {
	q=P;
	p=p->next;
	}
	return head;
	}
	Choose the correct alternative to replace the blank line.

A	q = NULL; p->next = head; head = p;
B	q->next = NULL; head = p; p->next = head;
C	head = p; p->next = q; q->next = NULL;
D	q->next = NULL; p->next = head; head = p;
Q7	The postfix form of (A + B) / (C + D) – (D * E)
A	AB+CD+/DE*–
B	AB+/CD+-DE*
C	AB+CD/+DE*-
D	AB+CD+/-DE*
Q8	Result of the postfix expression 832*4+- is?
A	3
B	2
C	-3
D	-2

Q9	Consider the linear queue given below which has FRONT = 1 and REAR = 5. Now perform the following operations on the queue: (a) Add G (b) Delete two letters(c) Add H (d) Add I (e) Delete three letters. | | A | B | C | D | E | | | |
A	H, G, I
B	G, H, I
C	G, I, H
D	H, I, G
Q10	Which of the following is an example of stack?
A	Person standing for withdrawing money
B	A set of bangles worn by a lady on her arm
C	Round Robin Process scheduling
D	Network Printing Job
Q11	Given a hash table of size 100, map the key 1892 to an appropriate location in the hash table using the Multiplication function.
A	30
B	32
C	34
D	35
Q12	Linear Search is inefficient as compared to binary search when array is ……..
A	small, unsorted
B	small, sorted
C	large, unsorted
D	large, sorted
Q13	Which of the following is not a limitation of binary search algorithm?
A	must use a sorted array
B	requirement of sorted array is expensive when a lot of insertion and deletions are needed
C	there must be a mechanism to access middle element directly
D	binary search algorithm is not efficient when the data elements more than 1500.
Q14	Starting from the node A at the top, which algorithm will visit the least number of nodes before visiting the node F? Payment 
A	Breadth First Search
B	Depth First Search
C	DFS and BFS will visit same number of nodes
D	Both BFS and DFS will not visit node F

Q15	 What will be the topological ordering for the above graph?
A	1 2 3 4 5 6
B	1 2 3 4 6 5
C	1 3 2 4 5 6
D	1 2 4 5 3 6
Q16	To represent hierarchical relationships between elements, Which data structure is suitable?
A	Stack
B	Queue
C	Graph
D	Tree
Q17	A binary tree T has n leaf nodes. The number of nodes of degree 2 in T is
A	$\log_2 n$
B	n-1
C	n/2
D	n
Q18	 What will be the Pre-order traversal output of above binary tree?
A	6 3 2 1 5 4 10 8 7 9 20 30
B	1 2 3 4 5 6 7 8 9 10 20 30
C	1 2 4 5 3 7 9 8 30 20 10 6
D	6 3 10 2 5 8 20 1 4 7 9 30
Q19	Select the correct statement from below with respect to the M-way search tree.
A	Number of Subtree may vary from 1 to M
B	A node can have 1 to M-1 values in every node.
C	Compulsory every node should have M-1 values
D	Compulsory every node should have M subtrees.

Q20	 After adding a left child to the node 18 in the AVL Tree above, how many nodes will be unbalanced?
A	1
B	2
C	3
D	4

Q2. (20 Marks Each)	**Solve any Four out of Six** **5 marks each**
A	Explain various operations performed on Data Structures.
B	Explain Double Ended Queue.
C	Write a function to implement following operations on doubly linked list i. Insert at beginning ii. Delete from beginning iii. Display
D	Construct the AVL Tree for the following numbers. **11 22 33 44 55 9 8 7 6 5**
E	What are different ways to represent graph in memory?
F	Consider a hash table with size=10. Using quadratic probing insert the keys 27, 72, 63, 42, 36, 18, 29 and 101 into the hash table. Take c1=1 and c2=3.

Q3. (20 Marks Each)	**Solve any Two Questions out of Three** **10 marks each**
A	Write a C program to implement circular linked list that performs following functions: i. Insert node in the beginning ii. Insert a node at the end iii. Display the list
B	Compute the Huffman code for each symbol.

Character	A	B	C	D	E	F
Count	9	12	5	45	16	13

C	Explain the DFS with example. Also write the program for Depth First Search.