Dated: 3rd December 2019   Time: 3:30 p.m.to 6:30 p.m.   Marks: 100

Instructions:
1. Write your B.Tech. Admission No/Roll No and other details clearly on the answer books while writing your B.Tech. Admission No on the question paper, too.
2. Assume and write necessary data with proper justifications, if any.
3. Be precise and clear in answering the questions.
4. Support your answer with the necessary diagrams and examples.

Q.1   Answer following (Any Five):   [30]

1) Define and Store the given graph information using two different data structures. Write one major advantage and disadvantage of each storage structure.
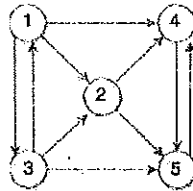
2) The Employee Code of 5 digit number is defined. Define the most suitable Data structure to store this information for total 85000 employees with unique Employee_ID. Draw the storage structure for the given Employee_ID

   Input : 23156, 29549, 14539, 78452, 23159, 23168, 14538

3) In a Max-Heap the key value of all the parent nodes must be greater among the keys of all the child nodes. And Min_heap contains minimum values with all the parent nodes with respect to their child nodes. Create BST for the given input sequence and then show stepwise creation of MIN_HEAP and MAX_HEAP from your BST.

   Input : 35 33 42 10 14 19 27 44 26 31

4) Define most suitable linked list data structure to check the list, palindrome or not. Using the proposed DS, write algorithm to check the same and also to print the middle node of the list

5) Write Algorithm to Union and Intersection of two Linked Lists
   Example:
   Input:
      List1: 10->15->4->20
      lsit2: 8->4->2->10
   Output:
      Intersection List: 4->10
      Union List: 2->8->20->4->15->10

6) a. List Advantages of BST over Hash table
   b. A hash table of length 10 uses open addressing with hash function h(k)=k mod 10, and linear probing. After inserting 6 values into an empty hash table, the table is as shown below.

0	
1	
2	42
3	23
4	34
5	52
6	46
7	33
8	
9	

   Q.1: Which one of the following choices gives a possible order in which the key values could have been inserted in the table? Justify your Answer.
   (A) 46, 42, 34, 52, 23, 33   (B) 34, 42, 23, 52, 33, 46
   (C) 46, 34, 42, 23, 52, 33   (D) 42, 46, 33, 23, 34, 52

Q.2   Answer the following (Any Four):   [32]
1)   The network of Twitter users is to be stored. Where each users will be connected with other users in term of friend link and follower link. Define suitable Data Structure to store this information and write an algorithm for Find_Freind( ) to find direct friends. Write algorithm to find friend of friend (Indirect friend at 2nd level) Using the Find_Freind ( ). Show stepwise execution of your algorithm using suitable example.
2)   Define the node structure for Ternary tree. Write algorithm to create this tree. Show the stepwise tree creation using the proposed algorithm and show the resultant tree for the given input sequence.
     Input : 56, 23,10, 34, 11, 54
3)   Write an Algorithm to create a Binary Arithmetic tree for the infix arithmetic expression with binary operators *, /, +, -, ^, following the conventional precedence of the operators. Following the algorithm, create the tree for the given Infix expression. Using the created arithmetic tree, derive related Prefix and Postfix expressions
     Input Infix Expression: A + B * C − D ^ E * F
4)   The link list of numbers is containing positive and negative numbers. Write an algorithm to create two descending order sorted link list of positive and negative numbers. Show the stepwise results for the given input list.
     Input: : 56, -94, -34, -109, 28, 78, 11, -5
5)   The student roll number and marks of 5 subjects are stored in a two dimensional array STU_MARKS. Define most suitable data structure to store link list for each Subject from the given array. Write algorithm to copy the value of given array STU_MARKS in the defined Data Structure.

	Marks				
	RollNo	Subject1	Subject2	Subject3	Subject4
STU_MARKS =	5	25	56	23	87
	3	56	38	29	84
	8	45	71	16	70

Q.3   Answer the following (Any Five):   [20]
1)   Let us consider that you are given a Queue data structure that supports standard operations like enqueue() and dequeue(). Write a pseudocode to implement a Stack data structure using Queue.
2)   Explain Inplace Sorting, External Sorting and Stable Sorting with the help of appropriate example.
3)   You have to sort 1 GB of data with only 100 MB of available main memory. Which sorting technique will be the most appropriate?
     (A) Heap sort
     (B) Merge sort
     (C) Quick sort
     (D) Insertion sort
     Justify you answer.
4)   Suppose we are sorting an array of eight integers using quicksort, and we have just finished the first partitioning with the array looking like this:
     2 5 1 7 9 12 11 10
     What are the possibilities of pivot elements ?
5)   Let us consider a situation where swap operation is very costly. Among Heap Sort, Selection Sort and Merge Sort, which of the sorting algorithms should be preferred so that the number of swap operations are minimized in general?
6)   A matched string is a sequence of {, }, (,), [, and] characters that are properly matched. For example, "{{()[]}}" is a matched string, but "{{()]}" is not, since the second { is matched with a]. Suggest suitable data structure so that, given a string of length n, you can determine if it is a matched string or not.

Q.4   Answer the following: [18]
1)   Write a recursive routine of Merge Sort. Show the trace of sorting the following key set using merge sort.
     11, 23, 36, 42, 58, 65, 74, 87, 94, 99
2)   Show the trace of the heap sort for following key set.
     42, 23, 74, 11, 65, 58, 94, 36, 99, 87
     A separate tree representing the state of the sort at the end of each pass of heap sort should be clearly drawn.
3)   Explain in detail three applications each of Stack and Queue.