Higher National Diploma in Information Technology
First Year, Second Semester Examination-2019
HNDIT1211: Data Structures and Algorithms

Instructions for Candidates:
Answer four (04) questions only.

No. of questions : 05
No. of pages : 05
Time : Two hours

Question 01

a. Define Data Structure? *Arrangement of Data Computer memory Storage* (02 Marks)

b. briefly describes primitive and abstract data types? give one example for each. (04 Marks)

c. Briefly explain the following terms. (06 Marks)
   i. Best Case Efficiency — *minimum steps of using resolve a Prot*
   ii. Worst Case Efficiency — *maximum* ''
   iii. Average Case Efficiency — *Efficency Average using All possil input*

d. Write C++ code to create the following array and display it on the screen. (Hint: consider the pattern of the data set when creating it) (06 Marks)

2	4	6	8	10	12	14

e. Write a C++ program that stores the given marks of the student and display the average mark of each student. Use 2D array to store the subject marks. (07 Marks)

| Mathematics	Science	English
75	62	88
85	82	90
55	63	73
70	61	65
59	63	70

Question 02

                                             (02 Marks)

a. Give Single answer to pointer?

b. Creating a structure to store ID number, Name, and Gender of an Employee   (05 Marks)

c. Compare and contrast Singly Linked List and Doubly Linked List with suitable diagram

                                             (06 Marks)

d. Implementing the following Linked List operations using structural diagram   (06 Marks)

     i.   initializeList()

     ii.   insertFirstElement(25)

     iii. insertAtEnd(30)

     iv.   insertAfter(25,50)

     v.   deleteElt(25)

     vi.   insertAtFront(42)
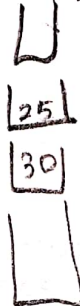
e. Write the following C++ method which is used to insert an element at the end of a linked list. Assume that the list nodes are created using Struct listNode.

                                               (06 Marks)

```
void LinkedList::insertAtEnd(int elt)
{

}
```

Question 03

  a. Compare Stack and Queue data structures?   (04 Marks)

  b. Briefly describe the two (02) different implementations of Stack using suitable diagrams?

                                               (04 Marks)

  c. Show the **graphical implementation** of following Stack operations.   (06 Marks)

     i.   initializeStack()

     ii.   push(15)

     iii. push(14)

     iv.   y = topElement( )

v.   x= pop() $x = 14$

vi.   isEmpty()

d.) Following C++ code represent the Static implementation of Stack. Write the relevant C++ code segment for the given blanks.

(06 Marks)

```cpp
#define STK_SIZE 20

class Stack {
        int top;
        int stack_array[.....(i)....];
    public:
            ...(ii)... ();
            void push(...(iii)....);
            ...(iv)... pop();
            ....(v)... isEmpyt();
            int isFull();
            void displayStack();
};

...vi....::Stack()
{
    top = 0;
}


void Stack::push(int value)
{
        if (top == STK_SIZE -1)
        cout<<"Stack ......(vii)........";
        else
        stack_array[......(viii)......]=......(ix)....... ;
}

void Stack::pop()
{
        if (top == ....(x)...)
```

cout<<"Stack Underflow";

....(xi)....

cout<<stack_array[...(xii)...]<<"Is deleted";

}

e. Write C++ code for the **displayStack()** method mentioned in the (Question(02) part d).

(05 Marks)

Question 04

Tree is hexaichical structure of root of node.

a. Define Tree data structure. (02 Marks)

b. Draw a Tree diagram using the following list of information. (04 Marks)
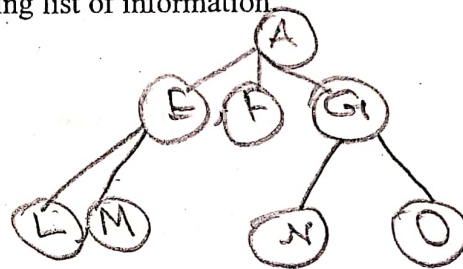
Root node: A

Leaf nodes: L, M, N, O

Level one nodes: E, F, G

Children's of node E: L, M

Parent of N and O: G

c. Define the following terms related to tree data structure. (06 Marks)

i. Path between two nodes

ii. Height of a Tree, *number of nodes in the tree*

iii. Degree of a Node *number of childre of the tree*

d. Differentiate the Binary Tree and Binary Search Tree using suitable diagrams (06 Marks)

e. Insert the following data set to the Binary Search Tree. Show the implementation using diagrams. (07 Marks)

30,12,9,18,33,45,16

Question 05

a. Briefly describe the enqueue and dequeue operations of the queue data structure using diagrams (04 Marks)

b. Sort the following data set using Bubble Sort Algorithm. Clearly mention your steps.
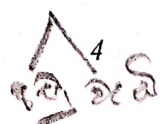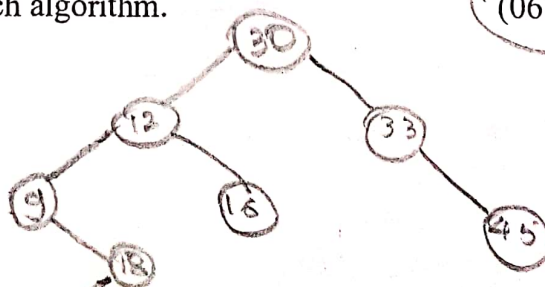
9,11,85,3,48,71,15,8 (06 Marks)

c. Write a pseudo code for Sequential Search algorithm. (06 Marks)

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d. State best case and worst-case efficiency for insertion and selection sort algorithms.

(04 arks)

e. Mention the steps to search the number 29 of the following array using Binary search algorithm.

(05 marks)

12	15	18	21	27	29	32