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SLIATE

SRI LANKA INSTITUTE OF ADVANCED TECHNOLOGICAL EDUCATION

(Established in the Ministry of Higher Education, vide in Act No. 29 of 1995)

Higher National Diploma in Information Technology

First Year, 2nd Semester Examination - 2013

IT 2003 – Data Structure & Algorithm (New)

Instructions for Candidates:
Answer any five (05) questions
All questions carry equal marks

Time : Three (03) hours

No of pages : 06
No of questions : 08

- (01) i. What is Data structure? (03 marks)
- ii. a) What are the differences between linear and nonlinear data structures? (04 marks)
- b) Give two (2) suitable examples for each of the above data structuring methods. (02 marks)
- iii. Without data structure methods also we can implement the programs. Then what are the advantages of using data structure methods? (06 marks)
- iv. a) What is an abstract data type? (03marks)
- b) Give two examples for abstract data type. (02 marks)
- (Total marks 20)

- (02) i. What are the advantages and disadvantages of an array data structure? (04 marks)
- ii. Write down the program to store vowels in an array and printing them. (06 marks)
- iii. Write down the algorithm for deleting an element from an array. (04 marks)

- iv a) What is a multi dimensional array? (02 marks)
- b) How do you insert the following data to a two dimension array (Write down the program code)?

5	3	2
8	4	1

(04 marks)
(Total marks 20)

- (03) i. What is a Linked list? (04 marks)
- ii. Draw the structural diagrams for the following tasks.
- a) Initialize the list (02 marks)
- b) Insert a new element into an empty list (02 marks)
- c) Insert an element at the beginning of the list (02 marks)
- d) Insert an element at the end of the list (02 marks)
- e) Delete an element from the list. (02 marks)
- iii. What are the advantages of Linked list? (03 marks)
- iv. What are the output of the following code segments? (03 marks)

```
#include <iostream.h>
#include "FloatList.h"
class FloatList
{
private:
    // Declare a structure for the list
    struct ListNode
    {
        float value;
        struct ListNode *next;
    };

    ListNode *head; // List head pointer
public:
    FloatList(void) // Constructor
        { head = NULL; }
    ~FloatList(void); // Destructor
```

```

void appendNode(float);
void displayList(void);
};
void FloatList::appendNode(float num)
{
    ListNode *newNode, *nodePtr;

    // Allocate a new node & store num
    newNode = new ListNode;
    newNode->value = num;
    newNode->next = NULL;
    // If there are no nodes in the list
    // make newNode the first node
    if (!head)
        head = newNode;
    else // Otherwise, insert newNode at end
    {
        // Initialize nodePtr to head of list
        nodePtr = head;
        // Find the last node in the list
        while (nodePtr->next!=NULL)
            nodePtr = nodePtr->next;
        // Insert newNode as the last node
        nodePtr->next = newNode;
    }
}
void FloatList::displayList(void)
{
    ListNode *nodePtr;

    nodePtr = head;
    while (nodePtr)
    {
        cout << nodePtr->value << endl;
        nodePtr = nodePtr->next;
    }
}

void main(void)
{
    FloatList list;

    // Build the list
    list.appendNode(2.5);
    list.appendNode(7.9);
    list.appendNode(12.6);

    list.displayList( );
}

```

(Total marks20)

- (04)
- i. "There are two ways for implement a stack". What are them? (03 marks)
 - ii. Illustrate the diagrammatical representations for the following operations of a stack.
 - a) Empty stack (02 marks)
 - b) Push(a) (02 marks)
 - c) Push(b)
already (a) value in a stack (02 marks)
 - d) Pop()
already (a) value and (b) value in a stack (02 marks)
 - iii. Implement the stack algorithm for the following functions in a stack.
 - a) Push(item)
 - b) Pop()
 - c) Display()(09 marks)
(Total marks 20)

- (05)
- i. Describe the "FIFO" and "LIFO" with examples. (04 marks)
 - ii. Write down the definition of Queue. (03 marks)
 - iii. Draw the array implementations of the queue for the following tasks.
 - a) Enqueue(A)
 - b) Enqueue(B)
already (A) enqueued
 - c) Dequeue()
 - d) Dequeue()
already (A) and (B) in the queue(04 marks)
 - iv. Write down the program code for the following functions in the queue (array based)
 - a) Insert an item to a queue.
 - b) Delete an item from a queue.
 - c) Display items in a queue.(09 marks)
(Total marks 20)

- (06) i List down different types of trees. (03 marks)
- ii. Define the following terms related to the tree with an example.
 a) Degree of a node
 b) Height of a tree
 c) Path between two nodes. (06 marks)
- iii. Write down the definition for the binary tree and draw the complete binary tree and mark the left sub tree and right sub tree. (05 marks)
- iv. a) What is a binary search tree? (02 marks)
 b) Insert the following data set into a binary search tree.
 25,6,21,18,17,5,3,18,25,6,18,17,5,7,9 (04 marks)
 (Total marks 20)
- (07) i. What is meant by sorting? (02 marks)
- ii a) Describe selection sort method and sort the following unordered data set using selection sort method 15,6,10,5,3,8 (03 marks)
 b) Write down the swap method (function) regarding to the selection sort. (03 marks)
- iii. a) Write down the algorithm for Bubble Sort. (03 marks)
 b) Following list consist of the original unsorted data elements. Sort these data set using bubble sort method.
 44,55,12,42,94,18,06,67 (04 marks)
- iv. a) What is meant by Big-Oh notation? (02 marks)
 b) Write down the complexity for following functions
 i. $7n-2$
 ii. $3n^3+20n^2+5$ (03 marks)
 (Total marks 20)
- (08) i. Define the terms Best, Worst and Average cases. (06 marks)
- ii. Write down the algorithm for Binary Search. (04 marks)
- iii. a) What is a sequential search? (02 marks)
 b) Find the efficiency of a sequential search in Best case, Worst case and Average case. (06 marks)

iv. If you have two algorithms called A and B ,find the faster algorithm.

(02 marks)

$$T_A(N)=1000N$$

$$T_B(N)=N^2$$

(Total marks 20)