THE OPEN UNIVERSITY OF SRI LANKA
DEPARTMENT OF COMPUTER SCIENCE
B.Sc. DEGREE PROGRAMME : LEVEL 03
CPU1142- DATA STRUCTURES AND ALGORITHMS
NO BOOK TEST I – 2016/2017

DURATION:One Hour (1 Hour)

Date: 08.10.2017 **Time: 1.00 p.m. – 2.00 p.m.**

Answer All Questions.

1. Fill in the blanks with appropriate terms.

a) An ..... is a mathematical model, together with various operations defined on the model.
b) Array is an example for a ..... data type.
c) ..... are created by giving names to a collection of cells.
d) The relationship between cells are represented using .....
e) The stack overflow condition needs to be considered when implementing ..... operation.
f) ..... linked list allow bi-directional traversing.
g) The function ..... is used in C language to free the storage of a dynamically allocated variable.
h) Information to a function is passed through ....
i) A ..... loop can be used to terminate at the bottom of the loop.
j) ..... data types are constructed out of basic data types .

2. State whether the following statements are **True** or **False**.

a) The "&" is a pointer operator, it returns the value of the variable located at the address that follows by the pointer.
b) There is no relationship between the contents of a node and the pointer to it in a linked list.
c) A structure is a collection of variables, which can be of similar data types.
d) If "avail" equals -1, it means that there are no more nodes to be used and overflow of the list.
e) The main shortcoming of a doubly linked list is inability of bi-directional traversing.
f) Variables that are visible to the entire program are known as global variables.
g) "stdlib.h" is the corresponding header file for input and output in C language.
h) Library functions are in built to C language such as scanf() and printf() functions.
i) Procedures are generalizations of basic data types.
j) The keyword "continue" allows taking the control to the beginning of the loop bypassing the statements inside the loop which have not yet been executed.

3.

Pointer implementation of a stack can be declared in C language as follows.

```
struct node
{
        int data;
        struct node *link;
};
struct node *top;
```

By using the above declaration, answer the following questions.

a) Show the pop operation of the stack using C programming language. Clearly show the required conditions and actions.
b) Show the push operation of the stack using C programming language. Clearly show the required conditions and actions.

4.

Following is a C coding for some operation.

```
void functionname()
{
        nodePtr *current, *first;
        current = last;

        if(current == NULL){
                return;
        }
        else if(current == current->next){
                free(current);
                last = NULL;
        }

        else{
                first = current->next;
                current->next = fist->next;
                free(first);
        }
}
```

By analyzing the above C coding, answer the following questions.

a) What is the data structure that this coding belongs to?
b) What type of implementation method is used to create the above mentioned data structure?
c) Which type of operation can be performed using the above C coding?

5.

Following is a C coding for some operation.

```
void functionname(void)
{
        nodePtr *ptr;
        if (tail ==NULL)
        return;
        else if (tail-> prev ==NULL)
        {
                ptr = tail;
                head = tail = NULL;
        }
        else
        {
                ptr = tail;
                tail = tail -> prev;
                tail -> next =NULL;
        }
        free (ptr);
}
```

a) What is the data structure that this coding belongs to?
b) What type of implementation method is used to create the above mentioned data structure?
c) Which type of operation can be performed using the above C coding?
d) Show all the steps of the above mentioned operation by using a diagram.