INTI International University & Colleges

FINAL
Examination Paper

(COVER PAGE)

Session	:	**APRIL 2017**
Programme	:	Diploma In Information And Communication Technology (DICTN)
Course	:	**ICT2102: Introduction To Data Structure**
Date of Examination	:	02 August, 2017 (Wednesday)
Time	:	5:00pm – 7:00pm Reading Time : Nil
Duration	:	2 Hours

Special Instructions :

Answer any **FOUR (4)** questions.

Materials permitted :
Non-programmable calculator

Materials provided :
Nil

Examiner(s) : **Koo Lee Chun** and Siti Hajar

Moderator : Siti Hawa Mohamed Said

This paper consists of 6 printed pages, including the cover page

DIPLOMA IN INFORMATION AND COMMUNICATION TECHNOLOGY
PROGRAMME (DICTN)
ICT2102: INTRODUCTION TO DATA STRUCTURE
FINAL EXAMINATION: APRIL 2017 SESSION

Instruction: Answer any **FOUR (4)** questions in the answer booklet provided.

Question 1

(a) Abstract Data Type (ADT) is implemented in many applications due to its many benefits. Discuss how ADT benefits the users.

(6 marks)

(b) State **FOUR (4)** differences between Array and Linked Lists.

(8 marks)

(c) Trace the output of the following code fragment:

```
int a=5;
int *x =.&a;
int *y;
y = new int;

*x = 10;
*y = 20;
*x = *x + 30;
a = a + 12;
cout << *x << "," << *y << "," << a << endl;
x=y;
x = *x + 10;
a= a+ 20;
cout << *x << " ," << *y << "," << a << endl;
```

(3 marks)

(d) Using diagram, show first pass of the working steps of bubble sort in ascending for the following:
34,47,12,80,45,13, 6, 10,2

(8 marks)

Question 2

(a) Suppose you have a List L that implements a static array with 3 items as following:

Tiger, Elephant, Lion

Show the result of the following sequence of events:
Insert (1, "Monkey")
Insert (3, "Bear")
Remove (4)
Insert (2, "Deer")

Note: Assume the number presents represent the position of the item.

(4 marks)

(b) Given an ADT LinkedList with private members as below :

```
struct Node {
    int item;
    Node *next;
};
Node *head;
Node *tail;
int numOfItems;
```

Implement the following new functions for the above Linked List :

int getTotal ( ) // return the sum of item values in the linked list item

(6 marks)

(c) There are various types of linked list implementation. Draw a diagram to represent each of the following types of linked-lists : (Assume 3 items in the list)

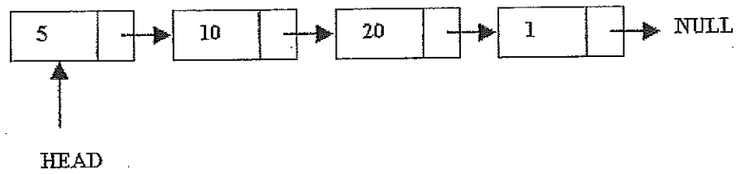
(i) Doubly Linked List

(4 marks)

(ii) Circular Linked List

(4 marks)

(d) Based on the linked list below, show the steps of deleting node 20 by re-drawing the diagram together with brief explanation for each step.



(7 marks)

Question 3

(a) Explain **THREE (3)** real world scenarios of queue operation. Your explanation must include the concept of insertion and deletion.

(6 marks)

(b) Discuss the differences between Queue and Stack.

(4 marks)

(c) Show the results of the following sequence of events :
enqueue(120), dequeue(),enqueue(40), enqueue(60), dequeue(),enqueue(40)

Present the data structure using:

(i) Array based Queue (Reminder to show the front and back index)

(4 marks)

(ii) Linked list based Queue

(4 marks)

(d) A simple array based implementation of the queue suffers from false overflow. Discuss with example the false overflow issue and solution.

(7 marks)

Question 4

(a) Given the following statements :

```
IntStack s;
s.push(70);
s.push(35);
s.push(65);
cout << s.pop( );
```

(i) Suppose that s is represented by an array. Draw the state of the private instance variables of s after the above code is executed.

(3 marks)

(ii) Suppose that s is represented by a linked list. Draw the state of the private member variables of s after the above code is executed.

(3 marks)

(b) Provide a linked list declaration of a Stack, showing the data structure involved and class interfaces. You can leave out the details implementation of the functions

(7 marks)

(c) Based on answer (b), provide the C++ implementation for **TWO (2)** main Stack operations.

(12 marks)

Question 5

(a) A tree data structure can be defined recursively as a collection of nodes where each node is a data structure consisting of a value. Illustrate a tree structure which include:
(i) Root node
(ii) Parent node
(iii) Child node
(iv) Leaf note

(4 marks)

(b) Construct a binary tree based on the following sequence :
40, 30,60,56,79,10,15,35,50

(6 marks)

(c) Traversal is a process to visit all the nodes of a tree and may print their values too. Traverse the binary tree from the Question 5 (b) using these methods:

(i) In-Order Traversal

(5 marks)

(ii) Pre-Order Traversal

(5 marks)

(iii) Post-Order Traversal

(5 marks)

Question 6

(a) Show how binary search works when searching for 14 in the following array :

5	8	10	14	26	38	45	58	67	69	74	82

(6 marks)

(b) Explain the differences between Insertion sort and Selection sort.

(4 marks)

(c) Stack can be used in the postfix expression evaluation.

(i) Convert the following expression into postfix

5 * 3 – 7 / 2

(2 marks)

(ii) Show complete working steps (including stack contents) to evaluate the postfix stated as answer in Question 6 (c)(i)

(8 marks)

(d) Besides postfix expression evaluation, discuss ONE (1) applications of stack and steps involved.

(5 marks)

~ The End ~

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