FINAL ALTERNATIVE ASSESSMENT
Examination Paper

(COVER PAGE)

Session	:	**August 2020**
Programme	:	Diploma In Information And Communication Technology (DICTN) Diploma In Information Technology (DITN)
Course	:	**ICT2102: Introduction To Data Structure**
Date of Examination	:	December 15, 2020 (Tuesday)
Time	:	8.00am – 10.30pm Reading Time : Nil
Duration	:	2 Hours

Note: 30 minutes is added into the duration of the examination to factor in any connectivity matters and for you to scan and upload your scripts.

Special Instructions :

Answer **ALL** questions

Materials permitted :

Non-programmable calculator

Materials provided :

Nil

Examiner(s) : **Siti Hajar Khairuddin** and Christine Retnabai Rethinam Paul

Moderator : Chern Huey Rong

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

DIPLOMA IN INFORMATION TECHNOLOGY PROGRAMME (DITN)
ICT2102: INTRODUCTION TO DATA STRUCTURE
FINAL ALTERNATIVE ASSESSMENT: AUGUST 2020 SESSION

Instruction: This paper consists of **Section A EIGHT (8)** questions and Section B **ONE (1)** question. Answer all questions.

SECTION A: (80 marks)

Question 1

(a) In your own words, provide **THREE (3)** descriptions of Data Structure.

(6 marks)

(b) Write down the output for the code fragments below:

```
char myChar = 'A';
char* p = &myChar;
cout << *p;
myChar = 'B';
cout << *p;
*p = 'X';
cout << myChar;
char myChar2 = 'R';
char q*;
q = p;
cout << myChar;
```

(4 marks)
(Total: 10 marks)

Question 2

(a) In pointer objects, each variable you create in your program is assigned a location in the computer's memory. The value the variable stores is actually stored in the location assigned. Based on the program below, trace the variable representing:

(i) Data value
(ii) Address of data value
(iii) Pointer that holds the address of the data value
(iv) Content of address Pointer

```
#include <iostream>
using namespace std;
int main() {
    int *pc, c;

    c = 5;
    cout << &c << endl;
    cout << c << endl << endl;

    pc = &c;
    cout << *pc << endl << endl;
    cout << pc << endl;

return 0;
}
```

(4 marks)

(b) Structures are used to represent a record. Create a structure called `Vehicles` which has three records called `color, model` and `brand.` All records use `string` as datatypes. Declare one structure variable `Vehicles`.

(6 marks)
(Total: 10 marks)

Question 3

(a) Based on function `Display` below, create another function to represent function overloading which contains two arguments of type integer, and display the bigger integer between the two.

```
void Display(int x) // print an integer
{
 cout << x;
}
```

(5 marks)

(b) Keyword "`this`" is used to avoid ambiguity when different variables are referencing to the same object. Complete the code fragments below by filling up the blanks and replacing variables with "this" keyword:

```
Box& Box::operator=(const Box& a) {

if (a != &a) {
```

```
delete [ ] data;
size = ___.size;
data = new int[___]; // allocate new array
for (int i=0; i < ____; i++) {
data[i] = a.data[i];
}
}
return *a;
}
```

(5 marks)
(Total: 10 marks)

Question 4

Write a program to read the temperature of Selangor for 15 continuous hours into a dynamic array called `SelTemp`. Display the temperature that is higher than the average temperature from all the hourly input. Free memory of temperature before the program terminates.

(10 marks)

Question 5

Write a function called `FrontNode` which has one argument of type integer named `myData`. The function inserts data at the beginning of a singly linked list.

(10 marks)

Question 6

(a) By using variable `Name`, change the value of `author` to "`Samantha Claude`" and display `author`.

```
string author = "Sam Smith";
string& Name = author;
```

(2 marks)

(b) Convert the infix expressions to postfix expressions:

(i) (RK * (BK * (((CY + RY) + BY) * CK)))

(ii) ((S * ((((A + ((B + C) * D)) * F) * G) * E)) + K)

(iii) ((3 + 7) - (8 / 2))

(iv) (3 + (4 * (2 - (6 / 3))))

(8 marks)
(Total: 10 marks)

Question 7

(a) Class `AStack` contains two base types, `First` and `Second`. `First` is a stack of integers with capacity of 100 and `Second` is a stack with character strings of capacity of 10. Trace the output for class `AStack`.

```
AStack<int> First;
First.push(7);
First.push(13);
cout << First.top() << endl;
First.pop();
First.push(9);
cout << First.top() << endl;
cout << First.top() << endl;
First.pop();
AStack <string> Second (10);
Second.push("Hazif");
Second.push("Alicia");
cout << Second.top() << endl;
Second.pop();
Second.push("Hana");
```

(4 marks)

(b) Explain **TWO (2)** benefits of array implementation for a stack compared to implementation of linked list.

(6 marks)
(Total: 10 marks)

Question 8

(a) Write code fragments that illustrate a queue scenario in the bank. Assume that the queue will store the customer names. Use function called `enqueue()` to join queue ,`dequeue()` to leave queue, and `getFront()` to retrieve the customer at the front queue.

Amy joins the queue.
John joins the queue.
Alex joins the queue.

The bank officer entertains the first customer and let him/her out of the queue.
Brandon joins the queue.
The bank officer entertains the first customer and let him/her out of the queue.
Michael joins the queue.
The bank officer wants to know who is the next customer to be served.

(8 marks)

(b) Draw out the current queue structure to identify the front and back of the queue.

(2 marks)
(Total: 10 marks)

SECTION B (20 marks)

Question 1

(a) Create a tree, which has the following nodes.
60, 40, 35, 90, 1, 88, 54, 89

(4 marks)

(b) Determine whether the tree that you derived in (a) is a complete binary tree. Justify your answer.

(7 marks)

(c) Determine whether the tree that you derived in (a) is balanced. Explain the reason that the tree is balanced/unbalanced from the height of tree perspective.

(3 marks)

(d) Trace the pre-order traversal for a binary search tree using proper variables.

(6 marks)
(Total: 20 marks)

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