INTI International University & Colleges

FINAL
Examination Paper

(COVER PAGE)

Session	:	**APRIL 2018**
Programme	:	Diploma In Information And Communication Technology (DICTN) Diploma In Information Technology (DITN)
Course	:	**ICT2102: Introduction To Data Structure**
Date of Examination	:	31 July, 2018 (Tuesday)
Time	:	11:00am – 1:00pm Reading Time : Nil
Duration	:	2 Hours

Special Instructions :

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

Materials permitted :

Non-programmable calculator

Materials provided :

Nil

Examiner(s)	:	**Dr Lim Chia Yean** 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)
DIPLOMA IN INFORMATION TECHNOLOGY PROGRAMME (DITN)
ICT2102: INTRODUCTION TO DATA STRUCTURE
FINAL EXAMINATION: APRIL 2018 SESSION

Instruction: This paper consists of **SIX (6)** questions. Answer any **FOUR (4)** questions in the answer booklet provided. All questions carry equal marks.

Question 1

(a) Describe functional abstraction and data abstraction. Explain how a user could access the function or data through functional abstraction and data abstraction.

(8 marks)

(b) A programmer would like to write an ADT for registrar office system which can conduct various activities related to students' details.

i) Identify 4 ADT operations that can be performed at the ADT.

(4 marks)

ii) Provide 3 data types that can be used to store student data in the ADT.

(3 marks)

(c) Write a simple ADT class called GrabBooking. The class will store booking ID, pick up location, destination location, and pickup time (in 24hours format), Write out the ADT class that consists a constructor that can put booking ID as 0, pickup time as 0, and the 2 locations to null.

(10 marks)

Question 2

(a) Discuss how linked list has better advantage over an array in term of inserting or removing elements in the list.

(4 marks)

(b) A single linked list is a way to store a collection of elements. Each element in a linked list is stored as a node. Draw a diagram which shows a traversal algorithm in a single linked list to sum up FOUR (4) numbers: 6, 30, -12 and 19. Use the details to assist with your diagram:

(i) Show initial state
(ii) Assign a proper variable for the addition operation.
(iii) Show the steps by circling the current node.

(10 marks)

(c) Write a C++ function to insert a node at the end of a linked list.

(11 marks)

Question 3

(a) Explain the operations of push(), pop() and peek(). (12 marks)

(b) Convert the infix of 180 / (3 + 2) into postfix expression. (3 marks)

(c) Show complete working steps (including stack contents) in C++ codes to evaluate the postfix stated as answer in (b). Your last line of C++ codes should display the answer of the mathematic calculation.

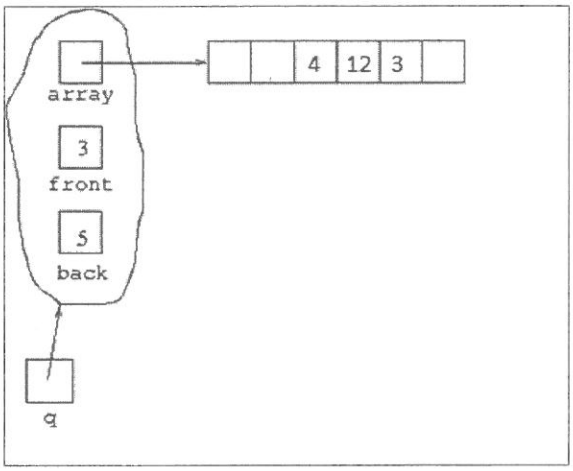
(10 marks)

Question 4

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

(6 marks)

(b) The diagram below shows the representation of queue (q) 4, 12 and 3. Suppose the length of the array is 6. Discuss what happens before and after a method `q.join(7)` is executed.



Your discussion should include:

(i) Which number is at the front index before the method `q.join(7)` is executed
(ii) Which number is at the last index method `q.join(7)` is executed
(iii) Where number 7 will be joined
(iv) What is the latest index number for node `front` and node `back` after `q.join` is executed.

(hint: index number in the queue starts at 1)

(6 marks)

(c) Briefly explain double-ended queue or deque. Assist your explanation with a drawing of an array that shows the location to perform insertion and deletion.

(5 marks)

(d) Write a C++ code snippet to insert an element in the rear of a queue. (8 marks)

Question 5

(a) Compare the differences between bubble sort and insertion sort. (4 marks)

(b) Explain why quick sort is more efficient than selection sort. (2 marks)

(c) Conduct the first pass of bubble sort for the number 9, 20, 15, 90, 58, 1, 60, 33. (7 marks)

(d) Conduct the full sorting process by using quick sort for the list of number 20, 44, 2, 55, 192, 47, 60. Show the output of the sorting (6 marks)

(e) Identify what is the type of sort from the function at the next page. Explain in your own words how the sorting process take place.

```
void Sort (int a[], int n)
{
    bool sorted = false;
    int temp;
    for (int pass = 1; pass < n && !sorted; pass++) {
        sorted = true;
        for (int i = 0; i < n - pass; i++) {
            int inext = i + 1;
            if (a[i] > a[inext]) {
                temp = a[inext];
                a[inext] = a[i];
                a[i] = temp;
                sorted = false;
            }
        }
    }
```

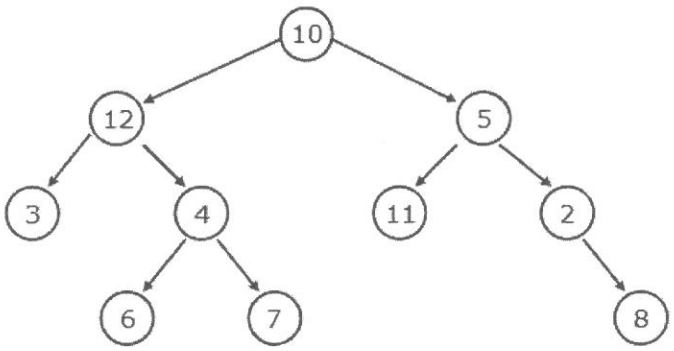
(6 marks)

Question 6

(a) Discuss **TWO (2)** ways in representing binary tree in memory. Assist your explanations with proper diagrams.

(10 marks)

(b) In a binary tree, traversal is a process to visit all the nodes of a tree and may print their values too. Traverse the binary tree below using these methods:



(i) In-Order Traversal (5 marks)

(ii) Pre-Order Traversal (5 marks)

(iii) Post-Order Traversal (5 marks)

~ The End ~