UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2012/ 2013

COURSE NAME	:	DATA STRUCTURE AND ALGORITHMS
COURSE CODE	:	BIT 10703
PROGRAMME	:	1 BIT
EXAMINATION DATE	:	JUNE 2013
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

THIS QUESTION PAPER CONSISTS OF **FIVE (5)** PAGES

Q1 (a) List **TWO (2)** advantages of linked list.

(2 marks)

(b) Write a linked list structure declaration to define a record of car parts containing:

- `part identification (integer)`
- `part name (maximum 20 characters)`
- `quantity on stock (integer)`
- `cost per unit (double)`
- `supplier's name (maximum 30 characters)`
- `pointer to the next node`

(4 marks)

(c) Write a C statement to create a pointer to the start of the list called `startPtr` based on the structure declared in **Q1(b)**. The list is empty.

(2 marks)

(d) Write a C statement to create a new node called `newPtr` based on the structure declared in **Q1(b)** using `malloc` function. Provide any necessary declarations and statements.

(2 marks)

(e) Write a C statement to assign the following values by using the node created in **Q1(d).** Use `strcpy` to assign string value.

```
Part ID          : 123
Part Name        : Door
Number of Stock  : 20
Cost             : RM800.45
Supplier         : ABC Enterprise
```

(6 marks)

(f) Assume that the list (car parts record) contains five nodes. Write a `while...loop` statement to print the `Part Name` and `Cost per Unit` in each nodes of the list based on the structure declared in **Q1(b)**. Use pointer called `currPtr` to traverse the list.

(4 marks)

Q2 (a) Analyze **TWO (2)** differences between stack and queue.

(4 marks)

(b) Based on **FIGURE Q2**:

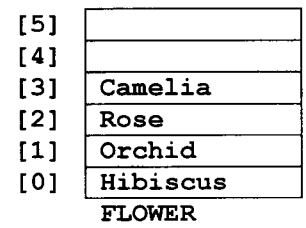

FIGURE Q2

Generate the content of the stack after each of the following operation is executed. Draw a diagram as in **FIGURE Q2** to show your work.

```
Operation 1 :  PUSH (STACK, Daisy)
Operation 2 :  PUSH(STACK, Iris)
Operation 3 :  POP(STACK,ITEM)
Operation 4 :  POP(STACK,ITEM)
Operation 5 :  PUSH(STACK, Jasmine)
Operation 6 :  POP(STACK,ITEM)
```

(6 marks)

(c) Assume that there are two empty stacks, `S1` and `S2`, and two empty queues, `Q1` and `Q2`, where the maximum size of the stacks and queues is 6 (array implementation). Generate the content of all stacks and queues after each of the following operation is executed. Draw a diagram to show your work.

```
Operation 1 :  ENQUEUE (Q1,19)
Operation 2 :  ENQUEUE (Q1,45)
Operation 3 :  PUSH (S1,6)
Operation 4 :  DEQUEUE (Q1,A)
Operation 5 :  PUSH (S1,A)
Operation 6 :  POP (S1,A)
Operation 7 :  ENQUEUE (Q2,A)
Operation 8 :  ENQUEUE (Q2,88)
Operation 9 :  PUSH (S2,16)
Operation 10:  PUSH (S2,21)
```

(10 marks)

Q3 (a) Describe **ONE (1)** type of sorting technique.

(2 marks)

(b) Given:

```
37,   35,   19,   27,   44,   51
```

(i) Determine the value for the first pivot. Show your work.
(ii) Based on the answer in **Q3(b)(i)**, draw a diagram to show the sorted number using Quicksort technique.

(6 marks)

(c) Given:

```
224,  291,  118,  148,  911,  289
```

Outline the difference between using Selection Sort algorithm and Insertion Sort algorithm to sort the numbers in ascending order. Draw a diagram to show the step in each iteration.

(12 marks)

Q4 (a) Analyze **TWO (2)** differences between Sequential Search and Binary Search.

(4 marks)

(b) **FIGURE Q4** shows the general Sequential Search algorithm to identify the target data in the list of array.

```
Algorithm : Sequential Search
   1. set begin to 0
   2. loop (begin<=last)
   1. increment looker
   3. end loop
   4. set locn to looker
   5. if (target equal data[looker])
   1. set found to true
   6. else
   1. set found to false
   7. end if
   8. return found
      end seqSearch
```

FIGURE Q4

Construct a C program that able to identify the target data in the list of array. Declare the initial data in integer value where the size of the array is 15. Call the function `sequentialSearching(int[])` to find

the target data. Use the algorithm in **FIGURE Q4** to develop the `sequentialSearching(int[])` function. Note that the function able to:

- `Read the input (target data) from the user.`
- `If the target data is found`
  - `Print the target data and the index of the data.`

  `else`
  - `Print the message that the target data is not found.`

(16 marks)

Q5 Given a list of the following numbers:

`82, 64, 95, 67, 96, 13, 94, 16, 4, 23`

(a) Generate a binary tree. Show your work.

(10 marks)

(b) Add the value of `92` to the generated tree in **Q5(a)**. Draw a new tree.

(2 marks)

(c) Delete the value of `95` from the generated tree after the step in **Q5(b).** Draw a new tree.

(2 marks)

(d) Write the traversal output for the original tree in **Q5(a)** using:

(i) preorder
(ii) inorder
(iii) postorder

(6 marks)

- END OF QUESTION -