THE OPEN UNIVERSITY OF SRI LANKA
B.Sc DEGREE PROGRAMME: LEVEL 04
CLOSED BOOK TEST: 2010
CSU 2279: DATA STRUCTURES AND ALGORITHMS

DURATION: **ONE AND HALF HOURS** (1 ½ HOURS)

Date: 30th April, 2010 Time: 4.00 pm – 5.30 pm

Answer ALL questions.

Q1.

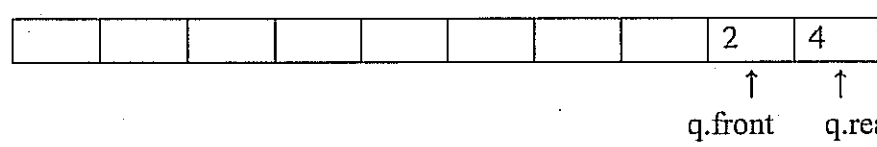
a) State the differences between the *Queue data structure* and the *Stack data structure*.

b) Write down some real world applications of *Stack* and *Queue*.

c) Consider the following operations and their definitions of a *Stack* data structure. Which operation is/are valid when comparing with their definitions?

MAKESTACK (S) - Make a stack S being empty stack
EMPTY (S) - Remove all items from the stack S
PUSH(X, S) - Insert element X into any location of the stack S
POP(S) - Delete the element from the position S
TOP(S) - Return the element at the top of the stack S

d) Consider the following current state of a *Queue* (Circular Array implementation) and the given series of operations.



Enqueue(1);
Enqueue(3);
Dequeue ;
Dequeue ;
Dequeue ;
Dequeue ;

If the above series of operations is performed, show the final state of the Queue by indicating the value of *front* and *rear* pointers.

Q2. Consider the following algorithm to merge two ordered arrays A and B into C.

Step 1: Perform a binary search for B[1] in the Array A.

Step 2: If B[1] is between A[i] and A[i+1] ,output A[1] through A[i] to the array C. Also output B[1] to the array C.

Step 3: Next perform a binary search for B[2] in the sub array A[i+1] to A[max] (where the max is the number of elements in the array A)

Step 4: Repeat the above procedure for every element of the array B.

a) Write a Pascal program to implement the above algorithm.

b) What is the data arrangement of A and B, where the above algorithm works most efficiency?

c) What is the data arrangement of A and B, where the above algorithm works least efficiency?

Q3.

a) What are the advantages of *pointer based list structure* over *array based list structure*?

b) Assume a list contains the following elements:
5, 10, 12, 6, 8

Write a Pascal program segment to delete the element with value 12. You should clearly state all the assumptions you make.