MURANGA UNIVERSITY COLLEGE

(A constituent College of Jomo Kenyatta University of Agriculture & Technology)

MAIN CAMPUS

ORDINARY UNIVERSITY EXAMINATIONS

2015/2016 ACADEMIC YEAR

SECOND YEAR SECOND SEMESTER EXAMINATIONS

FOR THE DEGREE
Of
BACHELOR OF BUSINESS INFORMATION TECHNOLOGY

COURSE CODE: ICS2105

COURSE TITLE: DATA STRUCTURES AND ALGORITHMS

SUPPLEMENTARY QUESTION PAPER

DATE: 30TH JUNE, 2016 **TIME: 2 HOURS**

INSTRUCTIONS TO CANDIDATES

Question ONE (1) is compulsory
Answer TWO (2) OTHER Questions

QUESTION ONE

ai) Define an array data structure used in programming. [2 marks]

ii) Outline the characteristics of arrays as used in c programming. [4 marks]

bi) Compare recursion and iteration as used in program algorithms. [4 marks]

ii) Explain what happens if there is no base criteria in a recursive program. [2 marks]

c i) Define the term traversing a tree data structure. [2 marks]

ii) State the three ways used to traverse a tree data structure. [3 marks]

iii) Describe how each of the stated traversal is used to access data on a tree structure. [6 marks]

d) Sometimes we need to remove an element from a queue out of sequence (i.e., from somewhere other than the head). What would be the sequence of queue operations to do this if in a queue of five requests, *req*1, . . . , *req*5 , we wish to process *req*1, *req*3 , and *req*5 immediately while leaving *req*2 and *req*4 in the queue in order? What would be the sequence of linked list operations to do this if we morph the queue into a linked list? [7 marks]

QUESTION TWO

a) Calculate the number of swaps which are required to sort the given array below using bubble sort. [4 marks]

{2,5,1,3,4}

b) A recursive function can go infinite like a loop. Describe two properties which should be included to avoid infinite running of recursive function. [4 marks]

c) Considering how the stack is used in executing recursive functions, describe what happens when the winding phase of a recursive process never terminates, perhaps as a result of a malformed terminating condition. [6 marks]

QUESTION THREE

a) Outline the algorithm for converting postfix notation to an infix notation. [8 marks]

b) Using a programing language of your choice, show how the following looping structures, can be used with a one dimensional array to display a list of four integers.

[12 marks]

While loop
For loop
Do…while loop

QUESTION FOUR

a) Trace the following code, showing the contents of the queue q after each call of the array ArrayQueue q[]; 6 marks

```
q.enqueue("A");
q.enqueue("B");
q.enqueue("C");
q.dequeue();
q.dequeue();
q.enqueue("D");
q.enqueue("E");
q.enqueue("F");
q.dequeue();
q.enqueue("G");
q.dequeue();
q.dequeue();
q.dequeue();
```

bi) If the binary search is so much faster than the sequential search, why would the latter ever be used? [2 marks]

ii) What happens if the sequential search is applied to an element that occurs more than once in the array? [2 marks]

c) The stack data structure is applied in certain operations of arithmetic expressions, namely the prefix, infix and postfix notations.

i) With an example in each case, differentiate the following notations. [6 marks]
Prefix notation
Infix notation
Postfix notation

ii) Determine whether each of the following arithmetic expression is true of false about the postfix notation. [4 marks]

a. x y+ z+ = x y z+ +
b. x y+ z– = x y z– +
c. x y– z+ = x y z + –
d. x y– z– = x y z —