MERU UNIVERSITY OF SCIENCE AND TECHNOLOGY

P.O. Box 972-60200 – Meru-Kenya.
Tel: 020-2069349, 061-2309217. 064-30320 Cell phone: +254 712524293, +254 789151411
Fax: 064-30321
Website: www.must.ac.ke Email: info@must.ac.ke

University Examinations 2013/2014

FIRST YEAR, SECOND SEMESTER EXAMINATION FOR BACHELOR OF MATHEMATICS AND COMPUTER

AND

FIRST YEAR, SECOND SEMESTER EXAMINATION FOR BACHELOR OF SCIENCE IN COMPUTER SCIENCE

ICS 2105: DATA STRUCTURES AND ALGORITHMS

DATE: APRIL 2014 **TIME: 2HOURS**

INSTRUCTIONS: *Answer question **one** and any other **two** questions*

QUESTION ONE – (30 MARKS)

a) Distinguish between primitive data type and abstract data type. Give examples.(4 marks)

b) Giving examples, describe recursion. (4 marks)

c) Give an algorithm for concatenating two strings STRING_A and STRING_B. (4 marks)

d) Give three reason why you would choose linked list over array. (3 marks)

e) Name and explain three input cases and the effect on running time of an algorithm. (3 marks)

f) Describe the concept and motivation of circular QUEUE. Use illustration. (5 marks)

g) Using an example, demonstrate how quick sort works. (7 marks)

QUESTION TWO (20 MARKS)

a) What data structures are used to perform recursion? (4 marks)

b) Using an example of your choice clearly show the insertion and deletion of a node in your already existing singly linked list. Make sure your work shows the physical representation of a linked list and the pseudo code for insertion and deletion.(6 marks)

c) Explain the differences between ARRAY and STACK. (6 marks)

d) List four applications of STACK data structure. (4 marks)

QUESTION THREE (20 MARKS)

a) Using illustration, demonstrate how dequeue could be represented by Doubly-linked list. (6 marks)

b) Using the array given below, create a binary tree. (5 marks)
12 7 5 8 3 11 9 13 4 2

c) From the binary tree created above in Q3 (b), perform pre-order and post order tree traversal. (9 marks)

QUESTION FOUR (20 MARKS)

a) Make a comparison between array and pointer based implementation of ADT stacks (6marks)

b) Write down the algorithms for the following stack operations:
   i. Insert a new element into stack (4 marks)
   ii. Remove an element from the stack (4 marks)

c) Make a comparison between sequential and binary search algorithms. (6 marks)

QUESTION FIVE (20 MARKS)

a) Explain two data types used to implement ADTs. (4 marks)

b) Describe four applications of data structures in computing. (4 marks)

c) In terms of computational complexity, using big 0, explain the cost of: (6 marks
   i. Inserting element at the end of array list
   ii. Inserting element at end linked list
   iii. Deleting element in front of a list

d) Perform Pre-Order, In-order and Post-Order traversal on the following tree.
(6 marks)