

MACHAKOS UNIVERSITY

**SUPPLEMENTARY EXAMINATION FOR DEGREE OF BACHELOR OF COMPUTER
SCIENCE**

SCO 204: DATA STRUCTURES & ALGORITHMS

AUGUST 2018:

TIME: 2 Hours

INSTRUCTIONS: ANSWER QUESTION ONE AND ANY OTHER TWO QUESTIONS

QUESTION ONE (30 marks)

- a) Give one advantage and two disadvantages of using arrays to implement Abstract data Types (ADTs) (3 marks)
- b) Name two parameters that can be used to measure the system efficiency of data structures and algorithms (1 marks)
- c) Using Big Oh notation, give the worst-case running time of each of the following algorithms: Insertion sort, Heap sort, Depth-first search (3 marks)
- d) Define a heap, and give two applications of heaps (3 marks)
- e) Discuss the following as used in data structures. (6 Marks)
 - i. Primitive vs. Non Primitive Data structures.
 - ii. Linear vs. Non-Linear data structures.
 - iii. Contiguous vs. Non contiguous.
- f) Name three advantages of linked list implementation of ADTs? (3 marks)
- g) Describe three applications of queue ADT (6 marks)
- h) Differentiate separate chaining from open addressing (2 marks)
- i) Outline THREE most used types of graph representations (3 Marks)

QUESTION TWO (20 marks)

- a) Illustrate how stacks can be used for post-fix evaluation of the expression below (3 marks)
$$(6+2*3) / ((5-2)*4)$$
- b) Write pseudo-code that can be used to implement selection sort (10 marks)
- c) Consider a hash table of size 7 with hash function $h(k)=k \bmod 7$. For each of the collision handling methods below, show the table that results after inserting, in the given order, the values: 19, 26, 13, 48, 17 (7 marks)
 - i. separate chaining

- ii. linear probing
- iii. double hashing using a second hash function $h'(k) = 5 - (k \bmod 5)$

QUESTION THREE (20 marks)

- a) With the help of well-labeled diagrams, demonstrate the following operations on a stack.

(6 Marks)

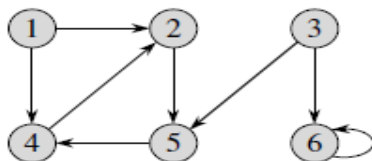
POP ()

Push ()

- b) Briefly describe ENQUEUE () and DEQUEUE operations on Queue. (4 Marks)
- c) Discuss the relevance of computer storage and data management in the study of data structure and algorithms. (5 Marks)
- d) Briefly describe (5 Marks)
- i. Complete binary tree and outline Two of its properties.
 - ii. Heap tree.

QUESTION FOUR (20 marks)

- a) Given the directed graph G below, use diagrams to show:
- i. Adjacency-list representation of G (4 marks)
 - ii. Adjacency-matrix representation of G (4 marks)



- b) Assign the keys 2, 3, 5, 7, 11, 13, 17, 19 to the nodes of the binary search tree below so that they satisfy the binary-search-tree property (4 marks)

