



MASENO UNIVERSITY

UNIVERSITY EXAMINATIONS 2017/2018

SECOND YEAR FIRST SEMESTER EXAMINATIONS FOR THE DEGREE OF BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY

MAIN CAMPUS

CIT 203: DATA STRUCTURES AND ALGORITHMS

Date: 16th February, 2018

Time: 8.30 - 11.30 am

INSTRUCTIONS:

- Answer ALL questions in SECTION A and any other TWO from SECTION B
- Write your registration number on all sheets of the answer book used.
- Use a NEW PAGE FOR EVERY QUESTION attempted, and indicate number on the space provided on the page of the answer sheet.
- Fasten together all loose answer sheets used.
- Mobile phones and PDAs are NOT allowed in the examination room.



SECTION A: ANSWER ALL QUESTIONS

Question one (30 marks)

1.a) Define the following data structures:

i) Stack (2mks)

ii) Heap (2mks)

iii) Hash Table (2mks)

iv) Array (2mks)

b) Write a java code that explains recursion by outputting set ,S in ascending form.

Set,S: {34,53,2,4,19,11,5,26,9}. (8mks)

c) Deduce a code that manifests the following expression: $n*(n-1)*(n-2)*(n-3)*(n-4)...n(1)$, let $n=7$.

(8mks)

SECTION B: ANSWER TWO QUESTIONS ONLY

Question Two (20 marks)

2.a) Write a java code for a Hashtable data structure to output the following individual scores:

Haqim: 35

Lewela: 45

Jaffary: 50

Nahwiri: 99

Sahara: 75

(10mks)

b) Illusratively(diagram and statement) define the following terms for input: {78, 69, 42, 17, 22, 81,

54, 49, 26, 61}

i) max Heap (5mks)

ii) min Heap (5mks)

Question Three (20 marks)

3.a) By creating instance 'xxt' (from Iterator), utilise the method, 'xxt.hasNext' to generate a Linked List code with the following output:

```
Maseno
Luanda
Kisumu
Nairobi
```

(8mks)

b) Apply 'this' java key word , the method 'add' performed on 'Ll' , and 'for(Book)' inorder to aid in writing a Linked List code that outputs the following parameters for Books,i.e: ID, Title, Author, Quantity

```
7374 Genetic Engineering H.L.Mfalme 12
7374 Digital Electronics T.K.Hariri 5
7374 Compiler Design J.D.Hikma 9
```

(12mks)

Question Four (20 marks)

4. a) Deduce the Binary Tree code that will draw the following Binary Tree:

(16mks)

```
16
 /\
9 11
 /\
7 15
```

**Hints:* - 'add' method has these args (Node master, Node slave, String orientation)
- Iteration should involve left and right orientations.
- Finally apply Getters and Setters to output the structure

b) Distinguish between a Hash Table and a Stack.

(4mks)

Question Five (20 marks)

5.a) Write the relevant Java codes, to explain the following stack concepts. Ensure the code indicates the creation of your stack.

- i) Inserts an object at the top of the Stack.
- ii) Removes and returns the object at the top of the Stack.
- iii) Returns the object at the top of the Stack without removing it.
- iv) Checks whether the stack has objects

(12mks)

b) Write the stack code that would place the following numbers as in the structure below.

45
53
21
39

(8mks)