MAASAI MARA UNIVERSITY

REGULAR UNIVERSITY EXAMINATIONS
2019/2020 ACADEMIC YEAR
SECOND YEAR FIRST SEMESTER

SCHOOL OF SCIENCE AND INFORMATION SCIENCES
BACHELOR OF SCIENCE (COMPUTER SCIENCE)

COURSE CODE: COM 2204
COURSE TITLE: DATA STRUCTURES AND ALGORITHMS

DATE: DECEMBER 3RD , 2019   TIME: 11:00 A.M – 1.00PM

INSTRUCTIONS

- Answer Question ONE and any other TWO Questions From Section II
- Question 1 is compulsory.

SECTION 1
Question 1, compulsory (30 marks)

(a) Define the following terms (10 marks)
  i. An abstract data type (ADT).
  ii. Data Types.
  iii. A complete tree.
  iv. Sorting.
  v. Data structures.

(b) Under what conditions would you choose an array for representing an abstract data type (ADT)? (2 marks)

(c) Explain the two properties of a linear structure (2 marks)

(d) Explain three desirable traits of an algorithm (6 marks)

(e) Explain the main steps in performing a merge sort (3 marks)

(f) Describe a linked list. Use a diagram to illustrate (3 marks)

(g) What are the considerations in the design of algorithms (4 marks)


SECTION II

Question 2, optional (20 marks)

a) Explain bubble sort (2 marks)

b) Given the following array, use bubble sort to sort the array in ascending order. Show the progressive change in the array through five iterations of the bubble sort algorithm(10 marks)

7	16	4	20	0	6	30

(c) Using the for-loop, Write a simple C++ program to implement bubble sort. More marks will be awarded for proper comments on your program (8 marks)

Question 3, optional (20 marks)

(a) Define a tree (2 marks)

(b) Given the following tree structure, perform a pre-order, in order and post order traversal giving a printout of the elements. Explain your answers. (10 marks)
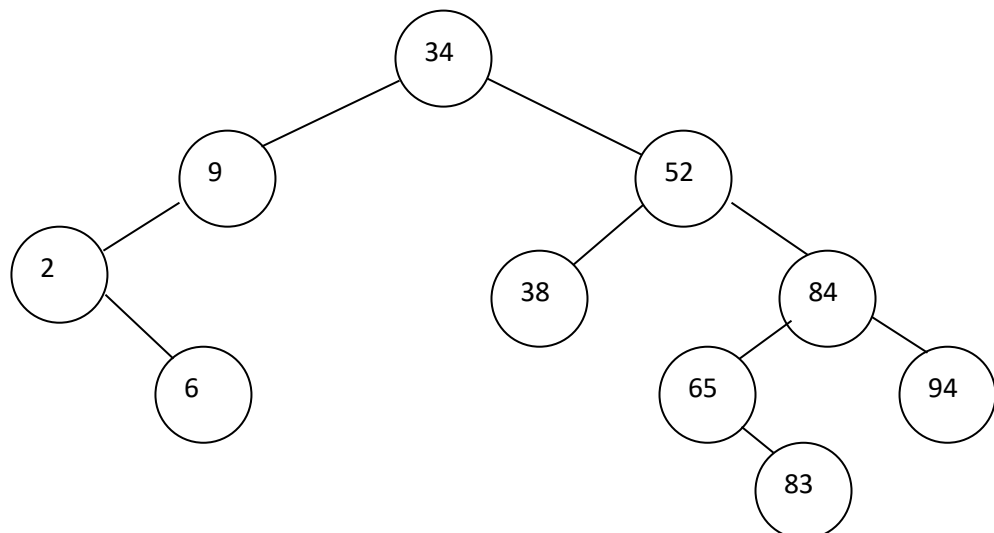
(c) Give a concise definition of complexity analysis, giving its goals and distinct phases (8 marks)

Question 4, optional (20 marks)

(a)   Briefly define a list (2 marks)

(b)   Explain any eight (8) possible operations on a list (8 marks)

(c)   The following is a program to implement a list. Complete the program so that it can add a
       fourth staff named Reindeer Rudolf, and delete the second staff. Show output of the final
       program (10 marks)

```cpp
01: #include <string>
02: #include <list>
03: #include <iostream>
04:
05: using namespace std;
06:
07: int main()
08: {
09:     list<string> staff;
10:
11:     staff.push_back("Cracker, Carl");
12:     staff.push_back("Hacker, Harry");
13:     staff.push_back("Lam, Larry");
14:     staff.push_back("Sandman, Susan");
15:
16:     /* add a value in fourth place */
17:
18:     list<string>::iterator pos;
19:     pos = staff.begin();
20:     pos++;
21:     pos++;
22:     pos++;
23:
//END
```