W1-2-60-1-6

# JOMO KENYATTA UNIVERSITY OF AGRICULTURE AND TECHNOLOGY

## University Examinations 2020/2021

## THIRD YEAR FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN COMPUTER SCIENCE

## ICS 2301 : DESIGN AND ANALYSIS OF ALGORITHM

**DATE: DEC 2021**

**TIME: 2 HOURS**

**INSTRUCTIONS: ANSWER QUESTION ONE (COMPULSORY) AND ANY OTHER TWO QUESTIONS.**

## QUESTION ONE (30 MARKS)

(a)(i) Distinguish among the three cases used in analyzing the running time of an algorithm. [6 marks]

(ii) Using the Pascal Triangle explain the working of dynamic programming. [4 marks]

(b) (i) Expound on the three steps of divide and conquer algorithm. [6 marks]

(ii) Differentiate between Djikstra's and Rim's algorithm. [4 marks]

(c)(i) Explain the growth of functions as used in Big Oh Notation. [4 marks]

(ii) Estimate the running time of the algorithm given below: [6 marks]

```
int I = 1, N,m,sum=0;
Input the No of elements to add, N
while I<N
{
      Input M;
      Sum+=m;
      I++;
}
Output Sum;
```

## QUESTION TWO (20 MARKS)

(a) Distinguish among the following terms used in the analysis of algorithms:
[6 marks]

(i) Space complexity.
(ii) Correctness.
(iii) Optimality.

(b) Identify and explain the algorithm that is used when looking up a phone number in mobile phone. [4 marks]

(c) With the aid of an example explain the experimental studies as an approach in analyzing the running time of an algorithm. [10 marks]

## QUESTION THREE (20 MARKS)

(a) Explain how backtracking can provide solutions to each of the following:

(i) Solving the maze. [6 marks]
(ii) 4-Queen problem. [6 marks]

(b) Expound on any two application areas of Minimum Spanning Tree algorithms.
[4 marks]

(c) Explain any three applications of randomization in modern computing.

[6 marks]

## QUESTION FOUR (20 MARKS)

(a) Using an example explain greedy algorithm. [6 marks]

(b) Explain any four factors that influence the running time of an algorithm. [6 marks]

(c) Using an example explain the working of the Brute Force algorithm. [8 marks]

## QUESTION FIVE (20 MARKS)

(a) Illustrate how Rim's algorithm will obtain the Minimum Spanning Tree for the graph given: [12 marks]

(b) Using the Stack Data structure as an example explain the potential method as a type of a mortised analysis. [8 marks]