KIBABII UNIVERSITY
(KIBU)

UNIVERSITY EXAMINATIONS
2019/2020 ACADEMIC YEAR

SPECIAL/ SUPPLEMENTARY EXAMINATIONS
THIRD YEAR FIRST SEMESTER

FOR THE DEGREE IN (COMPUTER SCIENCE)

COURSE CODE: CSC 312

COURSE TITLE: DESIGN AND ANALYSIS OF ALGORITHMS

DATE: 08/02/2021   **TIME:** 2.00 P.M.- 4.00 P.M.

INSTRUCTIONS

ANSWER QUESTIONS ONE AND ANY OTHER TWO.

QUESTION ONE [COMPULSORY]   [30 MARKS]

   a. Define an algorithm and explain different criteria that satisfy the algorithm?   [4 marks]

   b. Explain in brief the basic asymptotic efficiency classes.   [6 marks]

   c. What are the different techniques to represent an algorithm? Explain.   [4 marks]

   d. What is meant by time complexity? Define different time complexity notations giving example each case?   [4 marks]

   e. Explain Euclid's algorithm for computing gcd(m, *n*), *hence compute the gcd and the lcm of* 31415 and 14142)   [4 marks]

   f. Explain the concept of P and NP problems.   [4 marks]

   g. If you have to solve the searching problem for a list of n numbers, how can you take advantage of the fact that the list is known to be sorted? Give separate answers for

      i.   lists represented as arrays.   [2 marks]

      ii. lists represented as linked lists.   [2 marks]

QUESTION TWO   [20 MARKS]

   a. Discuss the Greedy approach to problem solving and briefly discuss the components of a greedy algorithm   [6 marks]

   b. Write the formula to find the shortest path using Floyd's approach hence or otherwise solve the following all pairs shortest paths problem.   [8 marks]

$$\begin{bmatrix} 0 & \infty & 3 & \infty \\ 2 & 0 & \infty & \infty \\ \infty & 7 & 0 & 1 \\ 6 & \infty & \infty & 0 \end{bmatrix}$$

   c. Use Kruskal's method to find min cost spanning tree for the following graph **[6 marks]**
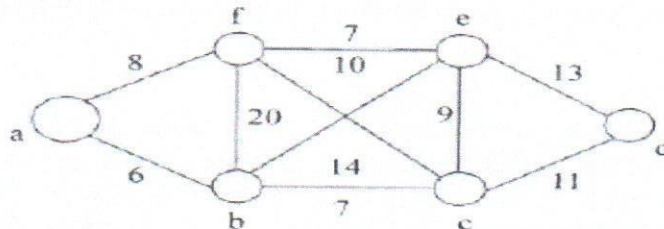
QUESTION THREE   [20 MARKS]

a. Write the Bubble sort algorithm (Ascending order), determine the running time (big O) and illustrate how it will sort the following list of elements: 89, 45, 68,90,29,34 and 17.

[12 marks]

b. Discuss any four advantages of using standard algorithms while developing a system

[8 marks]

QUESTION FOUR [20 MARKS]

a. Citing example scenarios, explain the following types of analysis

   i.   Best case

[2 marks]

   ii.   Worst case

[2 marks]

   iii.   Average case

[2 marks]

b. Describe the asymptotic notation and discuss one advantage of using asymptotic notations to analyze algorithms

[4 marks]

c. Discuss how a Divide-and-Conquer algorithm works and state the nature of problems that can be solved using this approach

[6 marks]

d. Algorithm analysis is the study of an algorithm's efficiency with respect to resource utilization, discuss these resources

[4 marks]

QUESTION FIVE [20 MARKS]

a. Algorithm analysis is the study of an algorithm's efficiency with respect to resource utilization, discuss these resources.

[5 marks]

b. Describe Dynamic Programming approach of solving problems and state any two example of algorithms that apply this approach.

[5 marks]

c. Describe the backtrack problem solving approach

[3 marks]

d. Solve the following instance of the knapsack problem by the branch and bound algorithm.

Item	Weight	Value
1	4	KES 40
2	7	KES 42
3	5	KES 25
4	3	KES 12

The Knapsack's capacity W=10

[7 marks]