



THE CATHOLIC UNIVERSITY OF EASTERN AFRICA

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MAIN EXAMINATION

JANUARY – APRIL 2019 TRIMESTER

FACULTY OF SCIENCE

DEPARTMENT OF COMPUTER AND LIBRARY SCIENCE

REGULAR PROGRAMME

CMT 309: DESIGN AND ANALYSIS OF ALGORITHMS

Date: APRIL 2019

Duration: 2 Hours

INSTRUCTIONS: Answer Question ONE and any other TWO Questions

- Q1. a) Discuss the following concepts as used in Analysis of Algorithms:
- i) Algorithm (2 Marks)
 - ii) Algorithmics (2 Marks)
 - iii) Big-Oh Notation (2 Marks)
 - iv) Growth rate (2 Marks)
 - v) Asymptotic Notation (2 Marks)
- b) Using an appropriate example/illustration, differentiate between the below terms:
- i) Divide-and-conquer and greedy techniques (4 Marks)
 - ii) empirical and theoretical analysis of an algorithm (4 Marks)
 - iii) space complexity and time complexity (4 Marks)
- c) Discuss in details about the analysis for recursive and Non-recursive algorithms (8 Marks)
- Q2. a) Discuss any THREE types of algorithms (6 Marks)
- b) List and explain Three different ways of representing sets (6 Marks)
- c) Write an algorithm for quick sort to sort C,O,M,P,U,T,E,R in alphabetical order. (8 Marks)
- Q3. a) Differentiate between the following concepts:
- i) Relation and Function (4 Marks)

ii) Deterministic and Non-deterministic algorithms (4 Marks)

iii) Recursive and Non-recursive algorithms (4 Marks)

b) Discuss the steps involved in the design and analysis of an algorithm. (8 Marks)

Q4. a) Using an appropriate example, differentiate between empirical and theoretical analysis of an algorithm. (4 Marks)

b) List and explain any THREE sorting algorithms you are familiar with. (6 Marks)

c) Rank the algorithm complexities from "fastest" to "slowest" (increasing dominance). 1 is fastest (good, low cost) and 6 is slowest (bad, high cost). (6 Marks)

$O(n^2)$	$O(n^3)$	$O(2^n)$	$O(n)$	$O(1)$	$O(n \log n)$

d) Show the best case and worst case efficiency of the linear search algorithm. (4 Marks)

Q5. a) Differentiate between the knapsack problem and the tower of Hanoi. (6 Marks)

b) State and explain the principle of backtracking. (4 Marks)

c) Explain any THREE characteristics of an algorithm. (6 Marks)

d) Discuss the measures used for finding the efficiency of an algorithm. (4 Marks)

END