THE CATHOLIC UNIVERSITY OF EASTERN AFRICA

A. M. E. C. E. A

MAIN EXAMINATION

AUGUST – DECEMBER 2018 TRIMESTER

FACULTY OF SCIENCE

DEPARTMENT OF COMPUTER AND LIBRARY SCIENCE

REGULAR PROGRAMME

CMT 309: DESIGN AND ANALYSIS OF ALGORITHMS

Date: DECEMBER 2018	**Duration: 2 Hours**
INSTRUCTIONS: Answer Question ONE and any other TWO Questions	

Q1.   a)   What is meant by the term algorithm? What is the relationship between an algorithm and a computer program?   **(6 Marks)**

b)   Define O-notation. What is its importance and usefulness in Analysis and Design of algorithms?   **(4 Marks)**

c)   What is a binary search? When and where can it be applied? **(4 Marks)**

d)   Differentiate between divide-and-conquer and greedy techniques. Comment on the effectiveness and efficiency of each.   **(6 Marks)**

e)   Discuss any THREE important problem types discussed in Analysis and Design of Algorithms.   **(6 Marks)**

f)   Explain how to analyze the time efficiency of non-recursive algorithms.
                                                        (4 Marks)

Q2.   a)   Explain what is meant Dynamic programming. Where can it be applied?
                                                        (4 Marks)

b)   List and explain any THREE traversal algorithms in a binary search tree.
                                                        (6 Marks)

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c) Define computational complexity as used in Design and Analysis of Algorithms. **(3 Marks)**

d) What is optimal binary search tree? **(3 Marks)**

e) Differentiate between Algorithm and Algorithmics. **(4 Marks)**

Q3. a) Discuss the means used for finding the efficiency of an algorithm
(4 Marks)

b) Differentiate between space complexity and time complexity.
(4 Marks)

c) Using an appropriate example/illustration, differentiate between best case, worst case and average case as used in Analysis and Design of Algorithms. **(6 Marks)**

d) Discuss the steps involved in the design and analysis of an algorithm.
(6 Marks)

Q4. a) Discuss any THREE characteristics of a good algorithm. **(6 Marks)**

b) Differentiate between the Order of growth and Asymptotic complexity as used in Analysis of Algorithms. What is the connection between the two concepts? **(5 Marks)**

c) Outline the procedure you would follow to Analyze a **for loop** **(9 Marks)**

Q5. a) Compare and contrast between the base case and the recurrent case.
(4 Marks)

b) Discuss any FOUR methods of solving a recurrence relation. **(8 Marks)**

c) Write an algorithm for quick sort to sort A, N, A, L, Y, S, I, S in alphabetical order. **(8 Marks)**

END