



**THE CATHOLIC UNIVERSITY OF EASTERN AFRICA**

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**GABA CAMPUS - ELDORET**

**MAIN EXAMINATION**

**SEPTEMBER – DECEMBER 2022 TRIMESTER**

**FACULTY OF SCIENCE**

**BACHELOR OF SCIENCE IN COMPUTER SCIENCE**

**DEPARTMENT OF COMPUTER AND INFORMATION SCIENCE**

**CMT 309: DESIGN AND ANALYSIS OF ALGORITHMS**

<b>Date: December 2022</b>	<b>Duration: 2 Hours</b>
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<b>Instructions: Answer Question ONE and any other TWO Questions</b>
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**QUESTION ONE**

- a) Define the term algorithm. **(2 Marks)**
- b) Any program is an algorithm, but the reverse is not true. Explain why. **(4 Marks)**
- c) How does a flowchart help a programmer in program development? **(4 Marks)**
- d) Algorithm analysis is the study of an algorithm's efficiency with respect to resource utilization; discuss these resources **(6 Marks)**
- e) Briefly discuss any four real world application areas of algorithms. **(4 Marks)**
- f) Citing example scenarios, explain the following type of analysis:
  - i) Best case **(4 Marks)**
- g) Write an algorithm that accepts a user input number then computes the sum of the digits. **(6 Marks)**

**QUESTION TWO**

- a) Differentiate between algorithm designing and analysis. **(4 Marks)**
- b) Write an algorithm for Bubble sort (Ascending order) and determine its running time (big O). **(8 Marks)**
- c) Draw and explain the flowchart symbols. **(8 Marks)**

### QUESTION THREE

- a) Discuss any four advantages of using standard algorithms while developing a system. **(8 Marks)**
- b) Describe the asymptotic notations. **(6 Marks)**
- c) State one advantage of using asymptotic notations to analyze algorithms. **(2 Marks)**
- d) Discuss how a divide and conquer algorithm works and state the nature of problems that can be solved using this approach. **(4 Marks)**

### QUESTION FOUR

- a) Write a recursive binary search algorithm. **(6 Marks)**
- b) State and explain at least three basic properties of an algorithm. **(6 Marks)**
- c) Discuss the Greedy approach to problem solving and briefly discuss the components of a greedy algorithm. **(8 Marks)**

### QUESTION FIVE

- a) Write short notes on:
  - i) Random access machine. **(5 Marks)**
  - ii) Primitive operation in algorithm analysis. **(5 Marks)**
  - iii) Back tracking. **(5 Marks)**
  - iv) Recurrence relations. **(5 Marks)**

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