



MACHAKOS UNIVERSITY

University Examinations for 2018/2019

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF COMPUTING AND INFORMATION TECHNOLOGY

THIRD YEAR SPECIAL/SUPPLEMENTARY EXAMINATION FOR

BACHELOR OF SCIENCE (COMPUTER SCIENCE)

SCO 308 DESIGN AND ANALYSIS OF ALGORITHMS

DATE: 27/9/2019

TIME: 2:00 – 4:00 PM

INSTRUCTIONS

This paper consists of FIVE questions

*Answer **question one** and other **two questions** in this paper*

QUESTION ONE

- a. Discuss Dynamic programming as an algorithmic technique in design and analysis of algorithms (3 marks)
- b. Outline five features of an optimal algorithm to a problem (5 marks)
- c. For a given problem, an algorithm is required to capture a number then compute its factorial. Provide the following
 - i. Algorithm description for the problem (2 marks)
 - ii. Pseudocode to implement the algorithm (2 marks)
- d. The Brute Force technique is widely used in both sequential search and in selection sort. Differentiate between these two tasks. (4 marks)
- e. One of the main questions asked in design and analysis is “How good is the algorithm?” Discuss the three aspects considered while answering this question. (4 marks)

QUESTION TWO

- a. Briefly describe the following combinatorial problems:
 - i. Travelling salesman problem
 - ii. Knapsack problem(6 marks)
- b. List and explain the TWO properties used to avoid infinite loop running in a recursive function (4 marks)
- c. Define backtracking then Differentiate backtracking and branch bound techniques as used in problem solving mechanisms (5 marks)
- d. Describe how to construct an optimal binary search tree in design and analysis of algorithm (5 marks)

QUESTION THREE

- a. The backtracking technique is used for state-space search problems. Briefly explain what such problem representations consists of. (6 marks)
- b. Define Big Omega Notation as it's applies in design and analysis of algorithms (4 marks)
- c. List and explain the advantages of binary search in comparison to other algorithms (5 marks)
- d. Discuss greedy algorithm as a technique of problem solving (5 marks)

QUESTION FOUR

- a. Describe the steps followed to completely implement a good algorithm. (10 marks)
- b. The Efficiency of an algorithm can be analyzed at two different stages, before implementation and after implementation. Discuss the two stages (6 marks)
- c. Describe Time and Space complexity of algorithms (4 marks)

QUESTION FIVE

- a. Define the following asymptotic analysis as used in testing the efficiency of an algorithm (6 marks)
 - i. Average-case
 - ii. Best case
 - iii. Worst case
- b. Design an algorithm and a pseudocode that can be used to add two numbers and display result (10 marks)
- c. Explain the application for knapsack problem in design and analysis of algorithm (4 marks)