University Examinations 2015/2016

THIRD YEAR SPECIAL/SUPPLEMENTARY EXAMINATIONS FOR DEGREE OF BACHELOR SCIENCE COMPUTER SCIENCE, BACHELOR OF SCIENCE INFORMATION TECHNOLOGY, BACHELOR OF SCIENCE COMPUTER TECHNOLOGY.

CCS 3326: DESIGN AND ANALYSIS OF ALGORITHMS

DATE: MAY 2016
TIME: 2 HOURS

INSTRUCTIONS: - Answer question one and any other two questions

QUESTION ONE (30 MARKS)

a) Define the term algorithm and briefly discuss any three real world application areas of algorithms.

(4 Marks)

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

(4 Marks)

c) Define a heap data structure and give two conditions that must be met when developing a heap.

(3 Marks)

d) Citing example scenarios, explain the following types of analysis

i. Best case

(2 Marks)

ii. Worst case

(2 Marks)

iii. Average case

(2 Marks)

e) State any four function growth rates and for each discuss the impact on the running time when the input size (n) increases.

(8 Marks)
f) Write an algorithm that accepts a user input number then counts and outputs the number of digits.  (5 Marks)

QUESTION TWO (20 MARKS)

a. Using an appropriate examples, describe the two paradigms used in greedy algorithm design  (6 Marks)

b. Discuss any three application areas of dynamic programming algorithms  (6 Marks)

c. Briefly describe the brute force approach to algorithm design and give one advantage and one disadvantage of the approach  (4 Marks)

d. Briefly describe the Travelling Salesman problem and illustrate why it is an optimization problem  (4 Marks)

QUESTION THREE (20 MARKS)

a) Describe the asymptotic notation and discuss one advantage of using asymptotic notations to analyze algorithms.  (5 Marks)

b) Discuss how a Divide-and-Conquer algorithm works and state the nature of problems that can be solved using this approach.  (6 Marks)

c) Write the recursive binary search algorithm  (6 Marks)

d) Determine the running time of the binary search algorithm in part c) above  (3 Marks)

QUESTION FOUR (20 MARKS)

a) Discuss the Greedy approach to problem solving and briefly discuss the components of a greedy algorithm.  (7 Marks)

b) Discuss the activity selection problem.  (3 Marks)

c) Write the greedy solution to the activity selection problem.  (4 Marks)

d) Describe the incremental paradigm, state a problem that can be solved using this paradigm and write the algorithm for the problem chosen.  (6 Marks)
QUESTION FIVE (20 MARKS)

a. Briefly describe the following terms as used with algorithm analysis

(i) Induction
(ii) Algorithm complexity
(iii) Control abstraction
(iv) Recursion
(v) Algorithm design

(10 Marks)

b. Every divide and conquer algorithm is characterized by two parts: partitioning and merging.

Using merge sort algorithm to illustrate, describe these two parts

(10 Marks)