ELIZADE UNIVERSITY, ILARA-MOKIN, ONDO STATE
FACULTY OF ENGINEERING
DEPARTMENT OF INFORMATION AND COMMUNICATION TECHNOLOGY

FIRST SEMESTER EXAMINATION, 2019/2020 ACADEMIC SESSION

COURSE TITLE: DATA STRUCTURE AND ALGORITHMS

COURSE CODE: ECT 535

EXAMINATION DATE: FEBRUARY, 2020

COURSE LECTURER: ENGR. T. T. ADEYEMO

TIME ALLOWED: 2 HOURS

HOD's SIGNATURE

INSTRUCTIONS:

1. ANSWER **QUESTION ONE (1) AND ANY OTHER THREE (3)**
2. SEVERE PENALTIES APPLY FOR MISCONDUCT, CHEATING, POSSESSION OF UNAUTHORIZED MATERIALS DURING EXAM.
3. YOU ARE **NOT** ALLOWED TO BORROW ANY WRITING MATERIALS DURING THE EXAMINATION.

Question 1

a. Differentiate between an array and a pointer. [2 Marks]

b. Complexity of an algorithm is a function describing the efficiency of the algorithm in terms of the amount of data the algorithm must process. Discuss the two main complexity measures used for the efficiency of an algorithm. [4 Marks]

c. Explain the difference between a sorting and searching algorithm. [2 Marks]

d. List two advantages of using Abstract Data Types (ADTs). [1 Mark]

e. Write a program in the following languages to demonstrate the working of recursion. Program output should be "321123". [6 Marks]

      i. C^{++}; and

      ii.   Java.

Question 2

a. Given two polynomial equations $5x^2 + 4x + 2$ and $5x + 2$. Write a function to add these two equations using C and express your answer with linked list. [6 Marks]

b. Back Tracking (BT) is a certain class of algorithm used for solving problems recursively. Illustrate with a pseudocode and use a tree as an example on how BT can be used to complete a solution A and B.[6 Marks]

c. Queue is an Abstract Data Type (ADT) similar to stack. Mention the basic operations of this ADT. [3 Mark]

Question 3

a. Explain with illustrations, the following types of graph: [6 Marks]

      i.   Connected graph;

      ii.   Disconnected graph; and

      iii. Complete graph.

b. Illustrate a simple representation of a stack runtime with push and pop operations using numbers (1-6).

                                                                    [4 Marks]

c. Elucidate on the difference between a class and an object using "box" as an example. [5 Marks]

Question 4

a. There are three (3) cases which are usually used to compare various data structure's execution time in a relative manner. Briefly discuss these three (3) cases. [6 Marks]

b. Array is a sequence of data item of the same type. Discuss the two types of array, with examples and appropriate illustrations. [6 Marks]

c. Clarify with illustration the basic differences between a list and an array. [3 Marks]

Question 5

a. Briefly discuss at least six (6) examples of Abstract Data Types (ADTs). [6 Marks]

b. Elucidate on the differences between linear and binary search

c. Write short notes on the following: [9 Marks]

      i.   Depth-First (DF) search;

      ii.   Breath-First (BF) search; and

      iii. Uniform cost traversal.

Question 6

a. Explain the word "Algorithm" and discuss the design techniques of greedy algorithms and divide-and-conquer algorithms. [5 Marks]

b. Discuss the following tree related terms: [6 Marks]

c.   ii.   Decision tree;

      iii. Transition diagram; and

      iv. Traversal algorithm.

d. What are the advantages and disadvantages of using a binary search tree? [4 marks]