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OFFICE OF THE DEPUTY PRINCIPAL
ACADEMICS, STUDENT AFFAIRS AND RESEARCH

UNIVERSITY EXAMINATIONS

2018 /2019 ACADEMIC YEAR

SECOND YEAR SECOND SEMESTER EXAMINATION

FOR THE DEGREE OF BACHELOR OF COMPUTER SCIENCE

COURSE CODE: COM 224

COURSE TITLE: DATA STRUCTURES

DATE: 15th April, 2019

TIME: 2:00PM-5:00PM

INSTRUCTION TO CANDIDATES

- SEE INSIDE

THIS PAPER CONSISTS OF 5 PRINTED PAGES

PLEASE TURN OVER

COM 224: COMPUTER ORGANIZATION

STREAM: BSc (Computer Science)

DURATION: 3 Hours

INSTRUCTIONS TO CANDIDATES

- i. Answer **ALL** questions from section A and any **THREE** from section B.
- ii. Maps and diagrams should be used whenever they serve to illustrate the answer.
- iii. Do not write on the question paper.

SECTION A (24 MARKS) COMPULSORY

QUESTION ONE [12 MARKS]

- a. Define the term data structure. **[2 marks]**
- b. Briefly explain the problems caused by increased applications complexity and increased data generation **[3 marks]**
- c. A queue can be investigated or modified using different operations. Briefly explain three operations performed on it. **[3 marks]**
- d. Define the term algorithm. **[2 marks]**
- e. Explain the need to perform algorithm analysis. **[2 marks]**

QUESTION TWO [12 MARKS]

- a. Derived data structures is divided into linear and non-linear. Define the term linear data structure hence state an example. **[3 marks]**
- b. Outline three operations that can be performed on different data structures. **[3 marks]**
- c. Generating an algorithm is problem and resource dependent. Briefly discuss. **[3 marks]**
- d. Describe how insertion sort is performed. **[3 marks]**

SECTION B [36 MARKS]

QUESTION THREE [12 MARKS]

- a. Describe an array. **[2 marks]**
- b. The first element of an array is always numbered 0. Explain what happens when you use an array index of less than zero for the first array element. **[2 marks]**
- c. The size of an array is determined by the number of values in the list. When designing an array, you decide to use an initialization list directly. What impact will it have on the array code? **[2 marks]**
- d. Ten people were randomly picked and their ages were recorded as follows:
- Kevin – 20 Dennis – 23 Frank - 25 Damaris – 27 Diana – 30
- After two days Frank decides to pull out meaning his data has to be removed from the array. Write a java program to perform: the array creation; and deletion of the single element; hence display your array output. **[6 marks]**

QUESTION FOUR [12 MARKS]

- a. Describe a queue with respect to data-structure? **[2 marks]**
- b. Differentiate between FIFO and LIFO with respect to data structures **[2 marks]**
- c. Contrast between 'enqueue' and 'dequeue' hence explain where each one of them is used. **[3 marks]**
- d. Design an algorithm which will enable you to insert an element Y in a queue Q which has N elements. **[5 marks]**



QUESTION FIVE [12 MARKS]

- a. What is a directed tree? [2 marks]
- b. A tree can not be traversed in a single run. However, traversing process can be done in three other different techniques - preorder, inorder and postorder techniques. Explain the procedures. [6 marks]
- c. Construct a tree for the given postorder traversal: Postorder: G D B H I E F C A [4 marks]

QUESTION SIX [12 MARKS]

- a. Books in a library have serial numbers to help the librarians organize them in their respective shelves. After being used nine books were picked from the tray having the serial numbers: 8, 3, 4, 1, 7, 9, 2, 6, 5. Sort while explaining the sequence of the serial numbers stepwise using:
- i. Bubble sort
 - ii. Selection sort
 - iii. Quick sort
 - iv. Merge sort [12 marks]

QUESTION SEVEN [12 MARKS]

- a. Explain three characteristics of an efficient data structure. **[3 marks]**
- b. Describe how an algorithm efficiency is measured. **[4 marks]**
- c. i. Define the terms: graph, directed graph, undirected graph and edge attribute. **[4 marks]**
- ii. In relation to a computer network, state an example of graph application of an undirected graph whose edge attributes are distances. **[1 marks]**

