**KABARAK UNIVERSITY**

**UNIVERSITY EXAMINATIONS**

**EXAMINATION FOR THE DEGREE OF BACHELOR SCIENCE IN COMPUTER SCIENCE**

**COMP 214: DATA STRUCTURES**

**STREAM: Y2S1 TIME:**

**EXAMINATION SESSION : APRIL DATE: 2019**

**INSTRUCTIONS:**

1. **This question paper has five questions**
2. **QUESTION ONE IS COMPULSORY AND HAS 30 MARKS**
3. **Answer any other two questions worth 20 marks each.**

**QUESTION ONE (30 marks)**

1. Explain finiteness and definiteness as properties of any algorithm **(2marks)**
2. What are the disadvantages of linked lists over arrays **(2marks)**
3. Explain any two applications of stack **(2marks)**
4. What is complexity analysis? Give two forms of complexity analysis with examples. **(5marks)**
5. What is the advantage of circular doubly linked lists over other linked lists **(2marks)**
6. Write a C function that expresses recursive computation of a factorial of a number *n* **(3marks)**
7. Explain Hash function with examples in hashing **(3marks)**
8. Demonstrate using a code to define stack as a structure in C programming language **(3marks)**
9. If the index position of the rear and the front of the queue are 3 and 1 respectively, how many elements are there in that queue? **(4marks)**
10. Explain the characteristics of a good hash function? **(2marks)**
11. Explain the two major operations of stack and the parameters specified in each of the operations **(2marks)**

**QUESTION TWO (20 marks)**

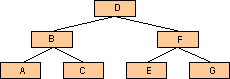
1. Write an algorithm for insert operation in binary search tree **(5marks)**
2. Draw any directed graph of five nodes. Demonstrate how to represent it using adjacency matrix **(5marks)**
3. What is the difference between complete and full binary trees **(2marks)**
4. Data structures can be classified on the basis of different characteristics. Explain any four characteristics with example in each. **(4marks)**
5. Compute the postfix and prefix of the following expressions; **A+B\*(D-F) (4marks)**

**QUESTION THREE (20 marks)**

1. How do you initialize rear and front in a circular queue **(2marks)**
2. Explain the syntax of declaration and assignment of values in a two dimensional array. **(3marks)**
3. While executing, an algorithm uses memory for three reasons. Explain them**(3marks)**
4. State any two primitive data structures and any two abstract data structures **(2marks)**
5. What is recursion? Write the procedure of executing the minimal number for the tower of Hanoi having any number of disks **(5marks)**
6. Draw a perfect binary search tree with seven nodes and demonstrate how to search for one of the leaf nodes **(5marks)**

**QUESTION FOUR (20 marks)**

1. Why do we consider an array elements as ‘similar’ and ‘finite’ **(2marks)**
2. Explain how test stack overflow and stack underflow in C **(4marks)**
3. Why is Tower of Hanoi considered as recursive function? **(2marks)**
4. What is a binary tree? Consider the following binary tree. Perform ***pre-order*** and ***in-order*** traversals on them.

 **(5marks)**

1. Demonstrate how you define a queue structure in C **(3marks)**
2. What is the effect of omitting a termination condition in a recursive method**(2marks)**
3. Analyze the following postfix expression and give the result ***6 3 2 4 + - \** (2marks)**

**QUESTION FIVE (20 marks)**

1. State any three parameters used in measurement of time complexity **(3marks)**
2. Explain any three features of a circular queue **(3marks)**
3. Explain using an example of any algorithm the best, worst and average case analysis of an algorithm **(3marks)**
4. Describe binary tree and the three of its traversal methods. **(4marks)**
5. Give any two scenarios where queue structure can be used in computing **(2marks)**
6. Develop a code in C to declare the following elements into one dimensional array and show their respective index positions; “Abc”, “Bcd”, “Cdf”, “Def”, “Fgh” **(5marks)**