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**University Examinations 2014/2015**

THIRD YEAR FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF COMPUTER SCIENCE

**CCS 3328: ABSTRACT DATA TYPES & ALGORITHMS**

**DATE: APRIL 2015 TIME: 2 HOURS**

**INSTRUCTIONS:** *Answer question* ***one*** *and any other* ***two*** *questions*

**QUESTION ONE (30 MARKS)**

1. Briefly describe the following terms as used with abstract data types
2. Data type (2 Marks)
3. Data abstraction (2 Marks)
4. Interface (2 Marks)
5. Algorithm (2 Marks)
6. Behavior (2 Marks)
7. Distinguish between data abstraction and data encapsulation (2 Marks)
8. Using an example to illustrate, describe the four properties of abstract data types (8 Marks)
9. Abstract classes and interfaces are two features of the Java programming language that support the implementation of abstract data types
10. What is an abstract class (2 Marks)
11. Distinguish between abstract class and interface (2 Marks)
12. Briefly describe why these two features are suitable for implementing abstract data types (4 Marks)
13. Outline two areas of application of stack ADT (2 Marks)

**QUESTION TWO (20 MARKS)**

1. The object oriented programming paradigm is often referred to as a programming for abstract data types
2. Give a brief justification to the above statement (2 Marks)
3. Outline four key concepts in object oriented programming that support abstract data types (4 Marks)
4. Briefly describe how each of the concepts in (ii) above support the abstract data type concepts (8 Marks)
5. The list abstract data type may be implemented as Array lists or linked list.
6. Briefly describe these two implementation (3 Marks)
7. Give the Java class used in each implementation (4 Marks)

**QUESTION THREE (16 MARKS)**

1. Define the Queue ADT and briefly describe the two main operations on a queue (6 Marks)
2. Give two Java interfaces used in the implementation of queue ADT (2 Marks)
3. The ICT Manager at Meru University would like to develop a program to keep track of the network access points in the university. He intends to keep track of the number of points, their location and status, among other things. You are contracted to develop the program
4. Why would abstract data types be appropriate for this situation (2 Marks)
5. What ADT would you use in your program and why (3 Marks)
6. What operations would you implement for the ADT. Give three (3 Marks)
7. Define a binary search tree and state two operations on the tree (4 Marks)

**QUESTION FOUR (20 MARKS)**

1. Write a simple Java program that would be used to implement a Class List (10 Marks)
2. Define a Heap ADT and briefly describe two operations on a heap (4 Marks)
3. Distinguish between depth first traversal and breadth first traversal as used with tree abstract data type. Use an example to illustrate (4 Marks)
4. Briefly describe the Java interface for tree traversal (2 Marks)

**QUESTION FOUR (20 MARKS)**

1. Write an abstract Java class that would be used in a program to compute the area of rectangular shapes such as rectangle, square, parallelograms and polygons. In your answer, give a brief description of your class and how you have used polymorphism (10 Marks)
2. State and briefly describe four Java collection classes, in the Java collections framework, used in the implementation of Abstract data types (8 Marks)
3. Give two areas where Stack ADT are applied in a computer system (2 Marks)