CHUKA   **UNIVERSITY**

UNIVERSITY EXAMINATIONS

SECOND YEAR SEMESTER TWO EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF SCIENCE IN COMPUTER SCIENCE

COSC 231: OBJECT ORIENTED ANALYSIS AND DESIGN

STREAMS: BSC (COMPUTER SCIENCE) Y2S2   **TIME: 2 HOURS**

DAY/DATE: THURSDAY 06/12/2018   **11.30 A.M. – 1.30 P.M.**

INSTRUCTIONS:

- **Answer Question One and any other two questions**

Question One (30 marks)

(a) Explain why object is the key concept in object oriented analysis and design.   (3 marks)

(b) Identify the UML diagrams used for the following: (3 marks)
    (i)   Modelling the behaviour of an object

    (ii)   Modelling interaction between groups of objects

    (iii)   Representing the functional behaviour of a system

(c) Identify the difference between Object Oriented approach and Procedural approach in program development.   (4 marks)

(d) Explain two ways object oriented programs implement polymorphism.   (4 marks)

(e) Explain the following object oriented concepts.   (4 marks)
    (i)   Encapsulation
    (ii)   Abstraction

(f) Consider the following inheritance hierarchy:

```
class A{
      protected:
            int x,y;
      public:
            int z;
}
class B: public A{
      private:
            int a, b, c;
}
```

    (i)   How many data members does B have? Explain   (2 marks)

    (ii)   How many of B's data members are visible outside B? Explain   (2 marks)

(g) Explain two differences between a class diagram and a use case diagram.   (4 marks)

(h) Explain the difference between a class and an object. Use C++ code sampleto show their differences.   (4 marks)

Question Two (20 marks)

(a) Discuss the difference between aggregation and composition types of relationships in a class diagram.   (4 marks)

(b) Define a class Person with the private data members: first name, last name, and date of birth; public member functions: get name and get date of birth and a constructor to initialize the data members.   (8 marks)

(c) Define another class Student that inherits from class Person and has with the following properties: student registration number, address, and programmme and the public operations: get grade and a constructor to initialize student details. Ensure that the Person constructor is called in the Student constructor.   (8 marks)

Question Three (20 marks)

(a) Explain the difference between single inheritance and multiple inheritance. Use an illustration with classA, classB, classC and classD.   (4 marks)

(b) Explain the basic components of a Use Case Diagram.   (4 marks)

(c) Produce a Use Case diagram for the scenario shown below: (12 marks)

Sports World is an Events Management Company that organise the running of major sporting games, such as the Commonwealth Games.

Before being used to host a sporting event, venues are assessed by an Administrator who checks that they are for fit for purpose. If the venue can hold more than 10,000 people, the Administrator conducts additional health and safety checks to ensure that the venue is safe. A year before the games begin, a Team of Staff are appointed to run the day-to-day operations, including booking successfully assessed/safety-checked venues. Six months before the games begin, the Team of Staff produce a Programme that lists the date, time and location of each sporting event. At this point, Athletes can register for an event by giving their name, address, date of birth and best time for their event. Some overseas athletes need to apply for a visa and the system needs to record whether they were successful.

A week before the games begin, staff produce a Schedule that shows when the registered athletes will participate in their event. At the end of each event, staff produce a Table of Results that records the positions of each athlete.

Once all the events are completed, the administrator checks the Table of Results for accuracy and produces a Medals Table.

Question Four (20 marks)

(a) Explain the use of interfaces in C++. Using code segment sample, show the syntax for declaring and using an interface (interface Shape) with two methods `draw()` and `color()`. Show how the interface will be utilized by two classes `Circle` and `Triangle`.

(6 marks)

(b) Consider the scenario shown below:

CrackIt Consultancy Services is organized into departments. Each department has employees working in it. The attributes of department are department code and department name. The attributes of employee include employee number, name, date of birth, gender, date of employment, basic pay and designation. Each department has a manager managing it. There are supervisors in each department who supervise a set of employees. Each department controls a number of projects. A project is controlled by one department. The attributes of project include project code and project name. An employee can work on any number of distinct projects in a day. The date an employee worked for a particular project, the time in and the time out has to be kept track.

(i)   Develop a class diagram for the above scenario.   (7 marks)
(ii)   Implement three classes showing general information on the operations for the classes
(7 marks)

Question Five (20 marks)

(a) Write a C++ parent class A with the following: public methods – `fg()`, `gy()`, and protected methods: `xy()` and `yx()`. Write also a derived class B that inherits A and has the following private methods: private `te()`, `pe()`.   (6 marks)

(b) Consider the system described below:

A system allows an existing customer to login. (For new customers, they first need to register). The airline has different destinations. A customer will choose their destination and select available airline planes scheduled for the day a customer wishes to travel. A customer is also expected to select the time of departure from the available list of departures to the chosen destination. A customer cannot complete reservation before paying the flight cost. Once a customer pays the flight cost, they are asked to confirm their reservation. If they fail to pay the total cost of the flight, the reservation is cancelled.

  (i)   Design an activity diagram to model the sequence of activities in an airline
        reservation system.   (7 marks)
  (ii) Using a sequence diagram, model the reservation process.   (7 marks)