UNIVERSITY OF EMBU

SECOND SEMESTER EXAMINATIONS 2017/2018

SECOND YEAR EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN COMPUTER SCIENCE

CSC 221: OBJECT ORIENTED ANALYSIS, DESIGN AND PROGRAMMING

DATE: APRIL 4, 2018   TIME: 11:00 AM – 1:00 PM

INSTRUCTIONS:

ANSWER QUESTION ONE AND ANY OTHER TWO QUESTIONS.

QUESTION ONE (30 MARKS)

a) Explain why object is the key concept in Object Oriented Development.   (2 marks)

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

c) Explain the major difference in object oriented analysis and object oriented design.

(4 marks)

d) Identify four reasons of building models both in analysis and in design.   (4 marks)

e) Explain the difference between encapsulation and data abstraction.   (4 marks)

f) Explain the difference between a class and an object. Use an appropriate illustration to show the differences.   (4 marks)

g) Consider the following inheritance hierarchy:
```
public class A{
    protected int x,y;
    public int z;
}
class B extends A{
    private int a, b, c;
}
```
a) How many data members does B have? Explain   (2 marks)

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

h) Explain the difference between method overloading and method overriding. (4 marks)

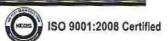i) Discuss four differences between a constructor and instance functions/methods.

(4 marks)

QUESTION TWO (20 MARKS)

a) Explain the difference between generalization and association relationships. Discuss the two types of association relationship. Give appropriate example to support your argument. (6 marks)

b) Identify classes and show the relationship between classes in the following statement.

(7 marks)

"An airline company has employees. A team builds an airplane which has a number of components. An airplane lands and takes off from an airstrip in an airport. The airplane carries passengers from a source to destination. An airplane is managed by a captain and co-pilot along with his cabin crew consisting of airhostess and attendants."

c) Write a Java 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(). (7 marks)

QUESTION THREE (20 MARKS)

a) Explain what a use case and an actor are in a Use Case Diagram. Why is a Use Case Diagram Important and at what stage in software development is it best used? Explain.

(5 marks)

b) Consider a system where a student is required to login to online portal with a student Id number, and their password. The student can check fee balance, generate fees statement, and check provisional results.

Develop a sequence diagram to model this system interaction. Show the objects involved in the interaction and the messages to be sent across. (7 marks)

c) A busy Restaurant consists of one Chef, a customer and one Waiter. The Chef is responsible for ordering all the food ingredients, preparation of the food and doing the washing up. The Waiter is responsible for taking the customer order, preparing the bill

and taking the payment made by the customer. The customer browses the menu, orders the food, consumes the food, orders the bill and pays the bill.

Draw the Use Case Diagram for the Restaurant showing role of Chef, Waiter and Customer. (8 marks)

QUESTION FOUR (20 MARKS)

a) Explain two types of coupling between objects. (6 marks)

b) Consider the following code in Object Oriented Programming. it defines the start of a class to represent a bank account.

```
class BankAccount{

private String name;
private int accountNumber;
private double balance;
private interestRate = 0.3;

  public BankAccount(String name, int acccountNumber,
  double balance){
      this.name = name;
      this.acccountNumber = acccountNumber;
      this.balance = balance;
  }
```

i) Add instance methods deposit() and withdraw() which increase and decrease the balance of the account. Make sure the withdraw() method doesn't allow the account to go into overdraft. Add a third method called addInterest() which adds interest to the balance (the interest should be the interest rate multiplied by the current balance). (8 marks)

ii) Create a subclass of BankAccount called StudentAccount. Every StudentAccount should have an overdraft limit of Kshs 10,000. Write a constructor for the new class. Override the withdraw() method to make sure that students can withdraw money up to their overdraft limits. (8 marks)

QUESTION FIVE (20 MARKS)

a) Explain the differences between <<include>> and <<extend>> relationships between use cases. Show their differences using a library system. Use your knowledge of how a library operates to illustrate your answer. (6 marks)

b) Consider an Airline reservation system described below:

A system allows an existing customer to login. (For new customers, they first need to register. Registration details: customer identification number, first name, last name, date of birth and date of registration). 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. System allows addition of departure times, flights, and airplanes for the system by the administrator. 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. The airline has many airplanes: the system allows the administrator to add new flights, add new planes, remove flights, remove planes, suspend flights, reroute flights/reschedule flights among others. A customer need see only necessary details in the system. Note: search facility for planes, flights, should be activated.

i) Generate use case diagram(s) targeting the entire system. (7 marks)

ii) Identify the system classes and their attributes and operations as described in this system and develop class diagram of the identified classes. (7 marks)

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