National University of Computer and Emerging Sciences, Lahore Campus

Course:	**Object-oriented Analysis & Design**	**Course Code:**	**CS-309**
Program:	**BS (Computer Science)**	**Semester:**	**Fall 2018**
Duration:	**60 Minutes**	**Total Marks:**	**30**
Paper Date:	**02-Oct-18**	**Weight**	**15 %**
Section:	**All**	**Page(s):**	**4**
Exam:	**Midterm-I**	**Reg. No.**	

Instruction/Notes: Solve the exam on this paper. Do not submit answer sheets. You may use rough sheets but those shouldn't be attached.

Question 1 **10 points**

Answer the following questions:

1. Which of the following statement is incorrect about object oriented paradigm?

   (a) Identifying appropriate abstractions is one of the major activity we perform during object oriented analysis
   (b) In object oriented analysis we analyze requirements from the perspective of the classes and objects found in the vocabulary of the problem domain
   (c) Any design prepared in UML is guaranteed to be the best object oriented design √
   (d) Object oriented programs are organized as cooperative collections of objects
   (e) A standard notation (UML) is used to depict object oriented design

2. Which of the following statement is incorrect about relationships between classes/objects?

   (a) Inheritance relationship can also be called "is a" relationship
   (b) Aggregation is a stronger form of association
   (c) Generalization can be considered a "part of" relationship √
   (d) Composition binds the lifetime of constituent objects with the container
   (e) Inheritance hierarchy enable the objects to have polymorphic behavior

3. Which of the following statement is incorrect?

   (a) Abstraction focuses on the observable behavior of an object
   (b) Encapsulation focuses on the implementation of an object
   (c) Encapsulation supports the concept of information hiding
   (d) Abstraction can be achieved without encapsulation √
   (e) Abstractions lets you focus on the essential aspects of an application while ignoring details

4. Which of the following relationship does not exists between classes?

   (a) Association
   (b) Aggregation
   (c) Composition
   (d) Inheritance
   (e) Polymorphism √

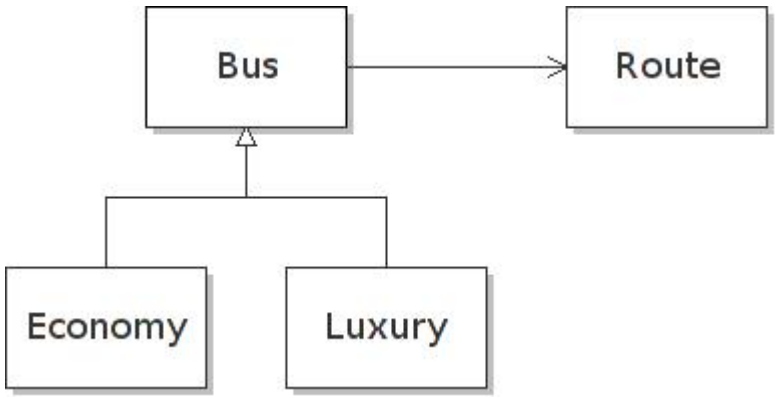
5. Which of the following statement is incorrect?

(a) Circle inherits Shape
(b) Circle inherits Sphere √
(c) Lion inherits Mammal
(d) Snake inherits Reptile
(e) Bus inherits Vehicle

Question 2 **10 points**

Consider a reservation system for an inter-city transportation company that operates buses on different routes. Each route is determined by a source and destination. On each route different buses run at different timings. There are two categories of buses that differ in services and consequently fare. Economy buses provide standard transportation facility and their fare is computed as a product of the route distance and base rate (fare per km). Luxury buses on the other hand have a higher base rate, considering reduced seating capacity. In addition, luxury buses provide different options for refreshments as well as extra luggage, the cost of which can be added to the fare.

Develop a UML class diagram to model this problem.



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Question 3 **10 points**

Write a **polymorphic** program to compute pays of employees working for an organization. An employee can either be a **SalariedEmployee** earning a fixed monthly salary or a **CommissionEmployee** who earns commission on the number of jobs completed using a fixed commission rate.

You may write code either in C++ or Java, but should clearly mention the language used. Also, make use of concepts like abstract class and/or interface where applicable.

```
class Employee {
      public:
            float computePay() = 0;
};

class SalariedEmployee : public Employee {
      private:
            float salary;
      public:
            float computePay() {
                  return salary;
            }
};

class CommissionEmployee : public Employee {
      private:
            float commissionRate;
            int jobsCompleted;
      public:
            float computePay() {
                  return commissionRate x jobsCompleted;
            }
};

void computePays(Employee* [] employees, int size){
      for(int i=0; I < size; i++){
            cout << employees[i]->computePay();
      }
}
```

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