**The application scenario**

An online car sale company needs to implement an e-business system. The system is a typical 3-tier enterprise application that integrates a presentation tier, a business tier and a persistence tier. After user requirement and budget analysis, the executive of IT Department of the company has decided to use Java EE open source technology and related platforms and tools for the implementation of the system. As an officer of the IT Department of the company, you are designated as the developer for the system core. To accomplish this task, you will need to design, implement, test and document

the e-business system.

The specifications

**1. The persistence tier**

a. The company sells both brand new cars and used cars, and may extend to more products in

the future through this general framework. A major assumption is that brand new car and used car share some common properties. For example, both brand new cars and used cars have the properties of Make, Model, Drive Type, Colour, Transmission, Engine, Fuel Type, Doors and Seats etc. However, a brand new car has speciality properties such as Warranty, Extending Warranty and Roadside Assistance Packages; a used car has speciality properties such as Odometer, Rego No., Rego Expiry, Service History and VIN (Vehicle Identification

Number) and Car History etc.

b. The car information must be persisted into a MySql Database. You are required to use Java

Persistence API (JPA) to persist the car information into a MySql database. In order to reduce

code redundancy, you should use inheritance mapping. That is, in your design and implementation, the Java entity classes should be at least 3 with 1 class as the super class to abstract the common properties and operations for both brand new car and used car and the other 2 classes as the sub-class for the specialty of a brand new car or a used car.

c. The company needs to store customer details and customer orders. You are required to use

entities to persist customer details and customer orders. The relationship between a customer and his/her orders must be one-to-many.

i.e. a customer can have multiple orders.

**2. The business tier**

Develop the business tier by using Enterprise Java Beans (EJB). The business tier will process the data persistence or retrieval requests from users and interact with the persistence tier for accomplishing the requests

**3. The presentation tier**

Develop the presentation tier by using JSP pages or angular JS. The presentation tier will

provide a web-based user interface, which will allow users to enter product (brand new cars

or used cars) details, customer details and order details and retrieve this persisted information when needed. Presenting exception messages, e.g. a user doesn’t enter data for a required textbox, is necessary and required for this tier.

4. Current tools and technologies include:

Java 8, JavaScript, 12 factor, Springboot, EXTJS,OAUTH2, REST API, GIT, Spring, SQL, JSP, WebSphere, Eclipse, Ant, Maven.   