19TS3001S (JAVA-PBL) IN-SEM SKILL EXAM
4th November 2020 5:30PM to 7:30PM

Instructions:

1. Answer any two questions. Each question carries 25 marks.
2. The class diagrams must be drawn using any UML tool but must follow appropriate syntax of UML 2.0
3. The solution must be coded either on a notepad or using any IDE.
4. The class diagrams and the code must be uploaded in LMS appropriately by 7:45PM.
5. This is an open book, un-proctored exam
6. Plagiarism check is done on every answer and any mal practice may result in awarding zero marks for the answer.

Question 1:

A) Develop a lazy instantiated Singleton class with name Master and write a driver class called Student which uses an object of the Master class.
B) What changes do you make in the code to make the Master class an early instantiated Singleton Class.
C) Along with the code for this question, draw the relevant class diagrams for both the cases of lazy and early instantiations of Singleton Class. Ensure the relationship between the Student and the Master class is rightly represented in the class diagram.

Question 2:

Shopper's Stop classifies their registered customers as Gold Customers, Silver Customers and Bronze customers based on the registration fee the customers pay initially while registering for the membership. The discounts for each of these categories varies as given below:

a. Gold Customers obtain 20% discount,
b. Silver customers obtain 15% discount and
c. Bronze customers obtain 5% discount.

The gold customers get an additional discount of 5% if the shopping date is around 10 days from specific festive dates while silver and bronze customers only get an additional 5% discount if the shopping date is around 5 days from the specific festive dates. Design an object-oriented solution with high cohesion and low coupling among the elements of design. Justify your solution by stating one more from the SOLID Design Principles. Support your code with appropriate Class Diagram.

Question 3:

Explain with an example how Dependency Injection varies the relationship between classes from aggregation to composition and vice versa. Which of these two relationships are advisable to design a maintainable solution. Explain with an example how multi-level dependency injection is incorporated.

Question 4:

The registration module is being developed in the ERP software of K L University. The Dean Academics Office imposes a rule that every department MUST follow a series of steps to register each student. The following are the steps involved:

1. Fee payment
2. Authentication of the student identity
3. Choice of courses and schedules
4. Confirmation of registration

The Dean Academics Office imposes a rule that these steps must be followed in the same order without fail but gives flexibility to each department on the processes that can be followed for each of these steps. As an example, departments have a choice to impose strict online fee payments while some departments may also accept cash and DD payments. Some departments insist on automated Aadhar verification for authentication of a student while in some departments the counsellors manually verify and approve the authentication. Design a solution with Dean Academics Office as a singleton class and each individual department inheriting from an abstract class called Department that imposes the above-mentioned template while still providing the flexibilities to its child classes. Support your design with an appropriate class diagram.

Question 5:

Create a class which maintains a collection of objects of Student class. Do a multi-level sort of the collection using the Comparable interface in Java API. The levels of sorting are given below.

Level 1: Descending order of the PIN Code of student's address

Level 2: Ascending order of the name of student

Level 3: Descending order of the student ID

Question 6:

Each department maintains a catalogue of courses offered by them in a semester. A solution must be designed and developed to read a .csv file for the catalogue and another .csv file containing Student ID (long type) followed by list of registered course codes separated by commas in each row. Sample registration data is given below for your reference. You must note that the file does NOT have headers. The list of courses registered for each student is collected in an appropriate collection which requires you to frequently sort the courses in an alphabetic order. The complete data of registration of all students must be stored using an appropriate collections framework which requires you to frequently search for individual student information. Based on the frequent operations (sorting of courses of each student and searching for individual student) that are required on the data, design a solution to use an appropriate collections framework. Justify how a hash set, tree set, hash map or tree map will be apt for designing this solution. Write the code to read the data from the file and display the data of each student through a console-based menu provision. The menu should have the following four options:

Option 1: to read registrations data from file,

Option 2: display list of courses registered by a specific student in ascending order.

Option 3: Manually register a student into a given list of courses

Option 4: Unregister a student from all courses

Sample .csv file for registration data is given below.

190032567,19CS2001,19CS2002,19CS2100,19CS2200

190031008,19CS2100,19CS2002,19CS2001,

190031009,19CS3100,19CS3200,19CS2100,

190031010,19CS3100,19CS2001,,

Also note that the program should throw a user defined exception called "CourseNotFoundException" when a student is registered into a course that is not available in the catalogue. The program should take all necessary precautions to close the IO streams prior to completion of the execution of the program.

Question 7:

An ice-cream shop offers ice-creams with basic flavours and additional toppings. The basic flavours available in the store and cost of each scoop is given below:

1. Vanilla – Rs. 50/scoop
2. Strawberry – Rs.60/scoop
3. Chocolate – Rs. 70/scoop

These basic ice creams can be customised with any number of toppings. Some of the toppings available in the store are:

1. Caramel – Rs.20 per serving
2. Choco-chips – Rs. 30 per serving
3. Sprinkles – Rs. 40 per serving
4. Marsh mellows – Rs. 50 per serving

A customer has the flexibility to order any number of scoops of any ice cream along with various toppings. They can order multiple servings of each topping. Design an object-oriented solution adhering to the SOLID principles with high cohesion and low coupling to calculate the total cost an ice-cream ordered by a customer. While you design the solution, you must also note that there is scope for the ice cream shop to increase the number of basic flavours and include various toppings as the business improves. The solution must be scalable and maintainable for all business enhancements.