DE52: Software Engineering - Final exam 2025P

Duration: 1h30

Model A

Note 1: Documents and electronic devices are not authorized.
Note 2: Indicate your model in the answer sheet (A or B).
Note 3: Given points are for information only (±1 point).

Exercise 1 (6 points)

Choose between (True/False) for the following statements. Leave it empty if not sure because the wrong answers are noted negatively (you lose points).

A. In all layered systems (even if relaxed), the components in a layer always interact only with components in their own layer or neighboring layers.

B. Conceptual integrity is often associated with encapsulation in object-oriented design principles.

C. Software architecture looks at the lower-level aspects of a system, whereas software design tends to look at the bigger picture.

D. Don't Repeat Yourself (D.R.Y.) is a rule related to the generalization principle in object-oriented design.

E. Inheriting from two or more superclasses can cause ambiguity.

F. Benefits of design patterns include design reuse, uniform design vocabulary/terminology, enhance understanding, restructuring, & team communication, basis for automation, abstract away many unimportant details.

Exercise 2 (10 points)

UML Modeling for an Anime-Inspired Magical Academy Video Game:

You are tasked with designing a single-player open-world RPG (Role-playing game) set in a prestigious magical academy called UTBM, where students (players) embark on quests to master abilities, battle monsters, and uncover ancient secrets.

The open-world RPG focuses on individual progression through training, missions, and exploration to gain experience. Players begin with a path (Solar, Lunar, or Void) and learn abilities tied to their path. They can enhance magical power, acquire weapons, and form alliances with other players. Non-player characters (NPCs) including mentors, monsters, and elders perform other tasks like assigning missions, guarding artifacts (secrets, abilities, weapons).

The game revolves around missions that test the player's strength and wisdom, often requiring them to retrieve magical artifacts hidden in sacred locations (e.g., enchanted forest of Sevenans, cursed ruins of Belfort). Failed missions force players to restart the missions or seek alternative paths. Combat with other players or monsters grants experience and artifacts. The combat could also injure the player and if a player's magical energy depletes, they collapse and respawn at a landmark with reduced power, losing temporary artifacts.

One key storyline arc involves the "Mission of the DE artifact". To complete it, a player consults an elder (YaZaN) to learn about the artifact's location. The elder gives a cryptic riddle hinting at its hiding place. The player explores sacred locations, battles monsters, retrieves the artifact, and returns it to the elder. If verified as authentic, the elder rewards the player with new abilities; if not, the player must retry the mission.

Questions

1. Draw a UML class diagram representing the entire system.
2. Draw a UML use-case diagram for the game's core functionalities.
3. Model the "Mission of the DE artifact " arc with a UML sequence diagram.
4. Draw a UML state machine diagram for the lifecycle of a player character.

Exercise 3 (4 points)

A. Explain the Goal of Polymorphism in Object-Oriented Programming.

B. You are given the following code in Java:

```
abstract class Shape {
   public abstract double area();
}
```

Implement two concrete subclasses: *Circle*, *Rectangle*, and implement the *main()* method to show how Polymorphism works in practice to calculate the area.

End of exam