



CSS323: Software Engineering

Midterm Mock Exam

curated by The Peanuts

Name ID Section Seat No

Conditions: Semi-closed Book

Directions:

1. This exam contains 12 pages (including this one).
2. Write your name and student ID clearly at the top.
3. Show your work for written questions. An answer without reasoning is like a Use Case Diagram with no actors: technically a diagram, practically useless.
4. This exam follows a *Waterfall* model. You cannot go back and change your answers once the next section has begun. There is no Sprint Retrospective.
5. This exam has 2 parts totaling **100 points** and a duration of **2 hours**.

*For solution, **click here**.*

Part I: Multiple Choice

*Choose the **best** answer for each question. Each question is worth **3 points**.*

1. A hospital commissions a software company to build a custom patient records system tailored to its specific workflows and policies. This type of software product is best described as a:

- a) Generic product, because it runs on standard hospital hardware
- b) Customized product, because it is developed specifically for that client
- c) Embedded software, because it operates inside medical devices
- d) Product-line software, because it can be sold to other hospitals later

2. According to the principles taught in this course, which of the following best describes the relationship between software development cost and software maintenance cost?

- a) Development cost and maintenance cost are always approximately equal
- b) Development cost is always higher because it requires the most skilled engineers
- c) Maintenance cost often exceeds development cost over the system's lifetime
- d) Maintenance cost is negligible if the software is well-designed from the start

3. A government agency is building a flight traffic control system. The requirements are well-understood, thoroughly documented, and will not change during development. Which software process model is MOST appropriate?

- a) Agile / Scrum, because of its flexibility and iterative nature
- b) Waterfall Model, because it suits stable and clearly defined requirements
- c) Evolution Model, because the system can be refined through multiple versions
- d) Spiral Model, because government projects always involve high risk

4. In the Scrum framework, which artifact is a prioritized, continuously updated list of *all* desired features and improvements for the product?

- a) Sprint Backlog
- b) Burn Down Chart
- c) Product Backlog
- d) User Story Map

5. In Extreme Programming (XP), during a Pair Programming session, which role is responsible for *writing* the code while the other reviews it in real time?

- a) Navigator
- b) Scrum Master
- c) Driver
- d) Product Owner

6. A bank is migrating from its legacy transaction system to a new one. Management decides to keep both systems running simultaneously, comparing outputs, until the new system is fully verified. This approach is called:

- a) Direct Conversion
- b) Phased Conversion
- c) Pilot Conversion
- d) Parallel Conversion

7. A requirements document states: “The system shall process a payment transaction and return a confirmation to the user within 3 seconds under normal load.” This requirement is best classified as a:

- a) Functional requirement, because it describes system behavior
- b) Organizational requirement, because it relates to company policy
- c) Non-functional (product) requirement, because it specifies a performance constraint
- d) External requirement, because it involves an external payment service

8. In BPMN 2.0, a gateway is needed at the point where a loan application process must simultaneously trigger a *credit check*, a *collateral assessment*, and an *income verification* — all three of which must complete before the process continues. Which gateway type should be used?

- a) Data-Based Exclusive Gateway (X)
- b) Event-Based Exclusive Gateway
- c) Parallel Gateway (+)
- d) Inclusive Gateway (○)

9. In a UML Use Case Diagram, the relationship where a base use case *always* calls another use case (e.g., every “Place Order” always triggers “Validate Payment”) is represented by:

- a) <<extend>> with a dashed arrow from base to the optional use case
- b) <<include>> with a dashed arrow from the base to the included use case
- c) Generalization with a hollow triangle from child to parent
- d) Association with a solid line between the two use cases

10. A team is designing a mobile banking application. The app communicates with an external service called “OmiseGo Payment API” to process transactions. How should this external service be modeled in a UML Use Case Diagram?

- a) As a Use Case (oval) inside the system boundary, since it performs actions
- b) As an Actor (stick figure) outside the system boundary, without any special notation
- c) As a System Actor outside the system boundary, annotated with the <<s>> stereotype
- d) As a Swimlane inside a BPMN pool, since it is a service component

Part II: Written Questions

Question 1

Scenario: TutorLink Platform

TutorLink is a web-based peer tutoring platform for university students. The platform operates as follows:

- A **Student** can register an account, search for available tutors, book a tutoring session, cancel a previously booked session, submit a review after a session is completed, and view their booking history.
- A **Tutor** can register an account, create and update their tutoring profile (subjects, rates), and set their weekly availability.
- An **Admin** can approve or reject new tutor registrations and manage user accounts (suspend/reactivate).
- When a student books a session, the system *always* processes a payment through the **Stripe Payment API** (an external service).
- A student may optionally apply a discount coupon when booking, which is an extended behavior of the booking process.
- Both Students and Tutors share the ability to log in and log out of the platform (modeled through generalization from a parent actor).

(a) [5 pts] Identify and list **all actors** in the TutorLink system. For each actor, state whether it is a *human actor* or a *system actor*.

(b) [5 pts] From the scenario, identify **one <<include>>** relationship and **one <<extend>>** relationship. For each:

- (i) State the base use case and the related use case.
- (ii) Explain in one sentence *why* that relationship type is appropriate.

(c) [25 pts] Draw a complete **UML Use Case Diagram** for the TutorLink platform based on the scenario above.

Question 2

Scenario: Course Drop Request Process

Peanut University has the following process for students who wish to **drop a course** after the normal add/drop deadline:

1. The **Student** submits a course drop request form through the university portal (a message that triggers the process).
2. The **Department Advisor** receives the request and reviews the student's academic standing.
 - If the student's GPA is below 2.0, the advisor *rejects* the request and sends a rejection notification to the student.
 - If the student's GPA is 2.0 or above, the advisor *approves* the request and forwards it to the Academic Office.
3. Upon receiving the approved request, the **Academic Office** must carry out **three tasks in parallel**:
 - Update the student enrollment records in the system
 - Issue a fee refund (if applicable).
 - Notify the course instructor via email.
4. Once *all three* parallel tasks are complete, the Academic Office sends a final confirmation to the student (message end event).

(a) [5 pts] Answer the following short questions about the scenario:

- (i) How many **Pools** should appear in this BPMN diagram? List them.
- (ii) What type of BPMN **Start Event** should be used to initiate the process? Justify your choice.
- (iii) What type of **Gateway** should be used when the Academic Office receives the request and must trigger all three tasks simultaneously?

(b) [5 pts] Identify the correct BPMN symbol (name and marker) for each of the following elements as they appear in this scenario.

- (i) The event that triggers the start of the process when the student submits the form.
- (ii) The task where the Academic Office updates the student enrollment records automatically through a system.
- (iii) The task where the Academic Office sends an email to the instructor.
- (iv) The gateway that the Advisor uses to choose between “Approve” and “Reject” paths (only one path is taken).
- (v) The event that ends the rejected path for the student.

(c) [25 pts] Draw a complete **BPMN 2.0 Process Diagram** for the Course Drop Request scenario described above.