



Daffodil International University
Department of Software Engineering
Faculty of Science & Information Technology
Final Examination, Summer 2025
Course Code: SE323; Course Title: Software Architecture & Design
Sections & Teachers: AE(A,B), FRR(C-E), ZZM(F,G),MMN(H),DDK(I)
Time: 2 Hour Marks: 40

Answer ALL Questions

*[The figures in the right margin indicate the full marks and corresponding course outcomes.
All portions of each question must be answered sequentially.]*

ExamPro – National Online Exam Platform (Monolithic Today)

ExamPro is a single Spring Boot monolith with a shared PostgreSQL database. Modules: Authentication, Exam Scheduling, Live Proctoring (WebRTC + AI cheat detection), Exam Delivery, Payments, Notifications, and Reporting.

Pain points:

- Exam windows cause 10x traffic spikes for Live Proctoring, but scaling affects the **whole app**.
- A crash in the AI module last month delayed payments and reminders.
- Six squads want different tech stacks, but all must release together.
- One big schema mixes PII, exam content, and payment data, causing security concerns.
- Universities request custom grading rules and branding without risking other clients' exams.

1.	a) From the scenario, investigate two reasons to keep ExamPro monolithic and three reasons to move to microservices. For each, state the main quality attribute affected, with proper justification.	[Marks-5]	CLO-2 Level-3
	b) Sketch an improved Microservice approach to solve the issues faced in monolithic.	[Marks-5]	CLO-2 Level-3
2.	a) Illustrate a Utility Tree for ExamPro. <ul style="list-style-type: none">• Identify at least 4 qualities.• For each quality attribute, provide one or more leaf scenario• Add Importance (H/M/L) and Difficulty (H/M/L) per leaf.	[Marks-10]	CLO-3 Level-4
	b) Identify the Sensitivity points and Tradeoffs for the given system considering their impact on quality attributes.	[Marks-5]	CLO-3 Level-4

	c) Based on your answer in 1(b) and 2(a,b), Now Classify step by step process for applying Architectural Tradeoff Analysis Method (ATAM) for Exampro , while shifting from Monolithic to Microservice.	[Marks-8]	CLO-3 Level-4
3.	In the current monolith, the ExamSessionManager class handles session control, AI cheat detection, payments, and notifications. The class directly calls external APIs for payments and notifications, mixes conditional rules for different universities, and has no clear interfaces for AI cheat detection.	[Marks-3]	CLO-4 Level-5
	a) Summarize three concrete SOLID violations present (name the principle each violates) and explain how each violation harms a quality attribute.		
	b) For each violation in 3(a), recommend strategies and state the quality attribute improved and how it eases future microservice extraction.	[Marks-4]	CLO-4 Level-5