



COMSATS UNIVERSITY ISLAMABAD (CUI)

DEPARTMENT OF COMPUTER SCIENCE
MIDTERM EXAMINATION FALL - 2025
BS (CS)- VI SEMESTER

Course: CSC291-Software Engineering Concept

Dated: 29/10/2025

Maximum Marks: 25

Time Allowed: 90 Minutes

Instructor: Ch Anwar Shaukat

Note:

- All questions are self-explanatory and require no further explanations during exam time.
- All answers must be written on the **answer sheet**, not on the question paper.
- Return the question paper along with the answer sheet.

CLO-1: Explain the concept of software engineering along with its processes and deliverables.

Q.1 Your team is developing a **collaborative learning platform**, and management is deciding on the most suitable **software development methodology** for each part of the project. Each case represents a distinct project scenario.

For each project requirement below, **select the most appropriate SDLC model** (e.g., Scrum, Waterfall, etc.) and **briefly justify your choice**.

Marks (4*2=8)

Project Requirement	Best-fit SDLC	Justification
The university wants a platform that can adapt quickly to curriculum updates and evolving academic needs, requiring the team to deliver usable versions at regular intervals.	Scrum (Agile)	Short sprints deliver working increments regularly; backlog reprioritization absorbs changing academic needs; continuous feedback from faculty/students guides rapid adaptation.
The university's student information system has fixed, verified requirements that must be developed in a clearly structured and sequential manner with minimal change expected.	Waterfall	Stable, well-defined scope suits linear phases (requirements → design → build → test → deploy); strong documentation and stage gates ensure predictability and compliance.
The development project places strong emphasis on software quality, with developers working in close collaboration and frequent verification of code correctness.	Extreme Programming (XP)	Practices like test-driven development, pair programming, continuous integration, and refactoring maximize code quality; frequent releases with collective ownership and on-site customer feedback.
The university plans to build a large-scale system that involves uncertainty and high risk, needing progressive refinement and risk control throughout development.	Spiral Model	Iterative cycles start with risk identification/mitigation, then prototyping and evaluation; supports progressive elaboration of requirements while actively managing technical and schedule risks.

CLO – 2: Identify functional and non-functional requirements for a medium sized software system.

Q.2

(Marks: 5+3)

You are part of a team developing a **University Student Portal**. One key feature is **Course Registration for the Next Semester**. The system must ensure that students can view available courses, register within allowed credit hour limits, and meet prerequisite conditions before registration is confirmed.

- Draw a detailed **mock-up** of the *Course Registration* screen on your answer sheet, then **write at least three functional requirements** and their **related business rules** derived from your mock-up.

Solution:

UNIVERSITY STUDENT PORTAL

Course Registration (Next Semester)

Waqas Ali (ID: 223344) Program: BSCS CGPA: 3.12

Allowed Credits: 12–18 Registered: 9 Remaining: 9

Available Courses

Code	Course Title	Cr	Days/Time	Room	Seats	Actions
CS201	Data Structures & Algorithms	A	Mon 10–12p	C 205	Add	<button>Detail</button>
CS220	Database Systems	B	Tues 12–14p	C 103	Waitlist	<button>Waitlist</button>
CS240	Operating Systems	A	Wed/Fri 10 a	C 312	Add	<button>Detail</button>

Selected Courses

Code	Title	Cr	Days/Time	Conflicts	Status	Actions
CS201	Data Structures & Algorithms	A	Mon 10–12	None	In Cart	<button>Remove</button>
CS240	Operating Systems	A	Wed/Fri 10 am–12	In Cart	In Cart	<button>Remove</button>

Subtotal Credits: 7 Final Total if submitted: 16

Validate Cart
Submit Registration

✓ Prerequisites satisfied for CS201, CS240;

⚠ You must reach at least 12 credits to submit.

i CS220 is full; Waitlist available.

Note: This is a sample student mockup. Actual design may vary, but all required contents and features must be fully displayed as specified.

UI Feature	Functional Requirement (FR)	Business Rule (BR)
Filters	FR-1: The system shall allow students to	BR-1: Only courses offered in the

(Term / Department / Search)	filter and search courses by term, department, and keyword, and shall refresh the course list accordingly.	selected term and eligible for the student's program and level shall be displayed.
Available Courses Table	FR-2: The system shall display each course with details such as code, title, credit hours, section, schedule, seats, prerequisites, and actions (Add, Details, Waitlist).	BR-2: If seat availability is zero , the system shall disable the Add button and shall enable the Waitlist option.
Add to Cart	FR-3: The system shall validate prerequisites, seat availability, and time conflicts before adding a course to the cart.	BR-3: A student shall not add a course unless all prerequisites are passed and no schedule conflict exists.
Cart and Credit Tracking	FR-4: The system shall display all selected courses in the cart and shall automatically update the subtotal and total credit hours.	BR-4: The student's total credits shall remain between 12 and 18 hours , unless an advisor-approved overload (up to 21) is granted.
Validate Cart	FR-5: The system shall allow the student to validate the cart and shall display detailed feedback messages about any issues found.	BR-5: Validation messages shall clearly identify which rule failed (e.g., missing prerequisite or time conflict).
Submit Registration	FR-6: The system shall re-validate all selected courses during submission and shall register all valid courses.	BR-6: Registration shall follow a first-come, first-served policy ; if a seat is lost mid-submission, only that course shall fail.
Waitlist Option	FR-7: The system shall allow students to join a waitlist for full courses and shall show their current waitlist position.	BR-7: Waitlisted courses shall not count toward credit-hour limits; when a seat becomes available, the student shall be notified and must confirm within 24 hours .
Remove from Cart	FR-8: The system shall allow students to remove any course from the cart, updating credits and conflicts immediately.	BR-8: Removing a course that has a co-requisite shall also remove the linked course automatically.
Messages Panel	FR-9: The system shall display real-time messages, warnings, and confirmations related to registration.	BR-9: Messages shall use visual indicators such as ✓ for success, ⚠ for warnings, and □ for information.

Note: All possible functional requirements have been provided in this solution. In the exam, students may write **any three** of these requirements, and they can select **any combination** of three from the list above.

- b. The requirements document for the student portal outlines various quality expectations. Based on each description below, identify the correct Quality Attribute (QA).

No.	Description in Requirements Document	QA
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1	The system shall log all attempts to access secure data by users having insufficient privilege levels.	Security
2	A trained administrative user shall be able to complete a student record update within an average of three minutes, and in a maximum of five minutes, 95% of the time.	Performance
4	The portal shall run consistently on mobile, tablet, and desktop devices without requiring software modification.	Portability

CLO – 3: Construct appropriate design models for the structure and behavior of a medium sized software system.

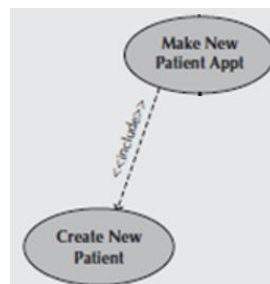
Q. No. 3: (4+5 Marks)

- a. Differentiate include and extend relationships used in use case diagram with example.

Solution:

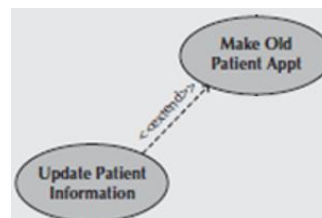
Include Relationship:

Used when a use case **always requires** the behavior of another use case. It represents **mandatory and reusable functionality** that is common across multiple use cases.



Extend Relationship:

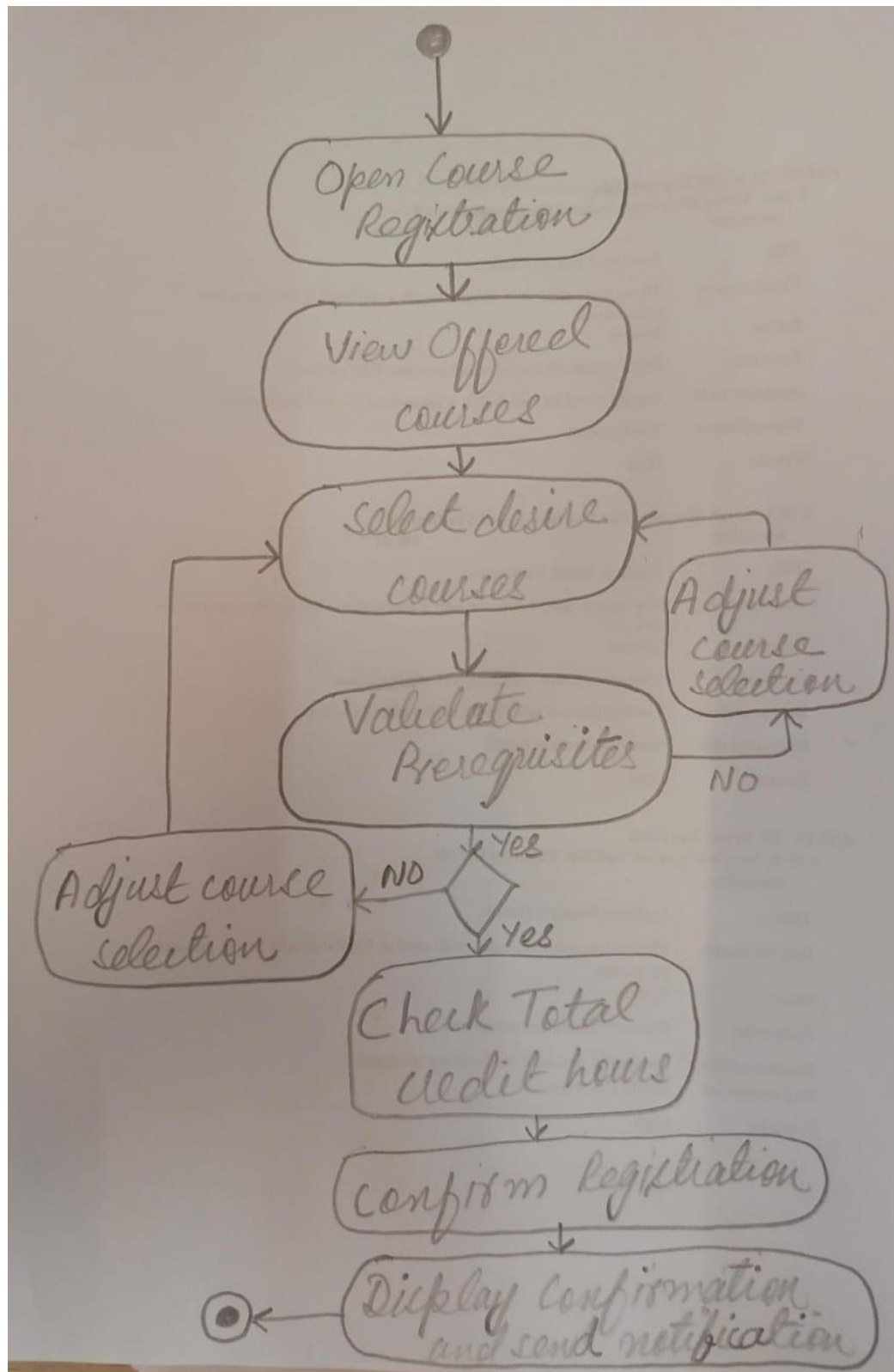
Used when a use case **optionally adds behavior of its own business process**. It represents **conditional or optional functionality** that occurs only under certain circumstances.



- b. Based on the Course Registration feature of the University Student Portal, draw an Activity Diagram that models how a student registers courses for the next semester (after logging into the portal).

Your diagram must include:

- Activities such as viewing offered courses, selecting courses, validating prerequisites, checking total credit hours, confirming registration, and displaying confirmation.



*****BEST OF LUCK*****