

Assignment: Software Engineering Fundamentals - Midterm Exam

Course: CS-301 Software Engineering

Instructor: Prof. Shubh

Date: September 28, 2025

Total Marks: 100

Duration: 3 Hours

Instructions:

- Answer all questions
- Show all your work and reasoning
- Use proper terminology and concepts
- Examples should be relevant and well-explained

=====

Question 1: Software Development Life Cycle (20 marks)

- a) Define the Software Development Life Cycle (SDLC) and explain its importance in software engineering. (5 marks)
- b) Compare and contrast the Waterfall model with the Agile methodology. Include advantages and disadvantages of each approach. (10 marks)
- c) Given a scenario where you need to develop a mobile banking application, which SDLC model would you choose and why? Justify your answer with specific reasons. (5 marks)

=====

Question 2: Object-Oriented Programming Principles (25 marks)

- a) Explain the four fundamental principles of Object-Oriented Programming (OOP). Provide a real-world analogy for each principle. (12 marks)
- b) Write a Java class diagram and corresponding code for a "Vehicle" hierarchy that demonstrates inheritance and polymorphism. Include at least three classes: Vehicle (parent), Car, and Motorcycle (children classes). (13 marks)

=====

Question 3: Software Design Patterns (20 marks)

- a) What are design patterns in software engineering? Explain why they are important. (5 marks)
- b) Describe the Singleton design pattern with a practical example. Include UML diagram and Java implementation. (10 marks)

c) Compare the Observer pattern with the Factory pattern. When would you use each? (5 marks)

=====

Question 4: Software Testing and Quality Assurance (20 marks)

a) Differentiate between Unit Testing, Integration Testing, and System Testing. Provide examples of what each type tests. (8 marks)

b) Explain Test-Driven Development (TDD). What are its advantages and potential challenges? (7 marks)

c) Design test cases for a simple login functionality that validates username and password. Include both positive and negative test cases. (5 marks)

=====

Question 5: Software Requirements Engineering (15 marks)

a) What are functional and non-functional requirements? Provide three examples of each for an e-commerce website. (8 marks)

b) Explain the importance of requirements validation and verification in software development. (4 marks)

c) List and briefly describe three techniques for requirements gathering. (3 marks)

=====

Additional Instructions:

- Use diagrams where appropriate
- Cite any references if used
- Ensure your answers demonstrate understanding of concepts, not just memorization
- Total word count should be approximately 2500-3000 words

Good Luck!