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

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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)

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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)

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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)

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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)

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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)

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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!