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Daffodil International University

Faculty of Science & Information Technology

Department of Software Engineering

Mid Term Examination, Fall 2026

Course Code: SE311; Course Title: Design Pattern

Sections & Teachers: NML(A,B,C,D), HBM(E,F,G,H), AAZ(I,J,K,L), MAB(M,N), AHR(O)

Time: 1:30 Hrs. **Marks: 25**

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.]

1.	*a)*	A university has two separate roles: a Teacher can conduct classes and evaluate students, while a Researcher can conduct research and publish papers. A special **academic** performs both **teaching** and **research** activities. **Construct** a Java code to represent this structure. Define the two roles separately, enable academic to perform all four activities, and create an Academic object to demonstrate them.	[Marks-4]	**CLO-1** *Level-3*
	b)	**Apply** your knowledge of code smells and refactoring to complete the following tasks. For each case, write the **smelly code first** and then **refactor the same code** using the specified remedy, without changing its functionality.	[Marks-8]	
		i. **Apply Inappropriate Naming** and refactor the code using **meaningful names.** ii. **Apply Large Class** and refactor the code using **Extract Class.** iii. **Apply Long Method** and refactor the code using **Replace Temp with Query.** iv. **Apply Black Sheep** and refactor the code using **Replace Inheritance with Composition.**		
	c)	**Demonstrate** key difference between runtime and compile time polymorphism	[Marks-3]	
2.	*a)*	A web application has a **ConfigurationManager** class that stores database settings and application configurations. Two threads call the **getInstance()** method at almost the same time during application startup. The developer notices that multiple configuration objects may be created, potentially causing inconsistent settings. The developer needs to implement a thread-safe to ensure both threads access the same configuration object. Finally, verify that both threads receive the same instance. Now, you have to complete the following tasks: i. **Identify** the name of design pattern that ensures only one **ConfigurationManager** object is created. ii. **Explain** how two threads can create separate objects when they call the **getInstance()** method at nearly the same time. iii. **Modify** the **getInstance()** method to make it thread-safe, and write a complete Java program using two threads to verify that both threads receive the same object	[Marks-1+1+3]	**CLO-2** *Level-3*

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	b)	A creative software company develops an AI story generation application named **DreamHablu**. Users can generate stories in three styles: **Fantasy, Mystery**, and **ScienceFiction**. Every story generator must implement the **generateStory()** method. The company wants to create story generators using a **StoryFactory** instead of directly instantiating concrete generator classes. The main application receives the selected style and requests an appropriate object from the factory. The returned object then generates a story using its own implementation. The application should use polymorphism to execute the correct method. The development team also wants to examine what happens if the factory receives a style that it does not support. Now, you have to complete the following tasks: i. **Build** the Java implementation of the Factory Pattern for story generation. ii. **Determine** the output when the user selects **Mystery**. iii. **Examine** why the main application does not need separate **if-else** statements for every story generator.	**[Marks-3+1+1]**	