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Daffodil International University

Faculty of Science & Information Technology

Department of Software Engineering

Final Term Examination, Spring 2026

Course Code: SE 311; Course Title: Design Pattern

Sections & Teachers: A-D(MHN), E-H(MRN), I(ZH), J(AZ)

Time: 2:00 Hrs **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.]

1.	*a)*	A software company is developing a Smart Home Control System. In this system, there are several separate sub-systems such as: **LightSystem**, **ACSystem**, **CameraSystem**. To improve usability, the company wants to provide a single simplified interface where the user can activate a "**LeaveHome**" system, and this system should internally control or take actions on the sub-systems. **Apply** the appropriate design pattern and write a Java code to develop the system mentioned above.	[Marks-6]	CLO-2 *Level-3*
	b)	An E-commerce company **'Online Dokan'** is developing an Online Payment System. The client system currently supports a standard interface called **Payment Gateway**, which defines a method: **pay(amount).** Now, the company wants to integrate two third-party payment services: **BkashAPI**, **RocketAPI.** To connect these two API's with the client, the system need two connectors. **Draw** the UML class diagram of the appropriate Design Pattern for the above scenario.	[Marks-4]	
2.	*a)*	In DIU employee management system, when a faculty member applies for leave, the leave request must go through several processing stages in sequence: • First, the **'Head' recommends()** the leave and forwards to the next. • Next, the **'Dean' approves()** the leave and forwards to the next. • Finally, the **'HR' processes()** the leave in the system. The leave request flow starts from the Main Class. **Construct** a Java code implementing the appropriate design pattern to develop the system mentioned above.	[Marks-9]	CLO-3 *Level-3*
	b)	A software company is developing a Text Editor Application. The editor allows users to format the **basic text** initially. Later, users can apply additional edit options such as: **Bold, Italic.** The Bold and Italic edit option classes should have a Parent class. There should be a **common interface** for both the basic and edited text. **Apply** the appropriate design pattern for the above scenario and write a Java code for it.	[Marks-6]	

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3.	*a)*	At DIU, the **Registrar Office** frequently sends important notices (e.g., exam schedules, holidays, policy updates) via email. The Registrar Office can **add**, **remove**, and **notify** two different groups: **Students, Employees.** These three groups can **receive** the notices from the Registrar Office. i. **Design** a UML class diagram for the above system. ii. **Construct** a Java code with the appropriate design pattern to develop this system.	[Marks-3+6]	CLO-4 *Level-6*
	b)	A developer is building a University Management System. The class **UniManager** stores student data, calculates fees, sends email notifications, and manages course registration. The system has a base class called **User** with methods such as **submitAssignment()**, **gradeStudent()**, and **admitStudent()**.Classes like **Student**, **Faculty**, and **Admin 'inherit'** from it, although some of them do not need all these methods. For notifications, the developer creates **emailnotification()** method directly inside the **UniManager** class. When **smsnotification()** method is later required, the same class is modified again to add the new feature. **Categorize** the above development principle violations, in terms of SOLID Principles with reasoning.	[Marks-6]	