



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.]*

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

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| 3. | <p><b>a)</b> At DIU, the <b>Registrar Office</b> frequently sends important notices (e.g., exam schedules, holidays, policy updates) via email. The Registrar Office can <b>add</b>, <b>remove</b>, and <b>notify</b> two different groups: <b>Students</b>, <b>Employees</b>. These three groups can <b>receive</b> the notices from the Registrar Office.</p> <p>i. <b>Design</b> a UML class diagram for the above system.</p> <p>ii. <b>Construct</b> a Java code with the appropriate design pattern to develop this system.</p>                                                                                                                                                                                                                                                                                                                                  | [Marks-3+6] | CLO-4<br>Level-6 |
| 5  | <p><b>b)</b> A developer is building a University Management System. The class <b>UniManager</b> stores student data, calculates fees, sends email notifications, and manages course registration.</p> <p>The system has a base class called <b>User</b> with methods such as <b>submitAssignment()</b>, <b>gradeStudent()</b>, and <b>admitStudent()</b>. Classes like <b>Student</b>, <b>Faculty</b>, and <b>Admin</b> 'inherit' from it, although some of them do not need all these methods.</p> <p>For notifications, the developer creates <b>emailnotification()</b> method directly inside the <b>UniManager</b> class. When <b>smsnotification()</b> method is later required, the same class is modified again to add the new feature.</p> <p><b>Categorize</b> the above development principle violations, in terms of SOLID Principles with reasoning.</p> | [Marks-6]   |                  |