

Daffodil International University  
Faculty of Science & Information Technology  
Department of Computer Science and Engineering  
Midterm Examination, Spring 2025

**Course Code: CSE221, Course Title: Object Oriented Programming**

**Level:2      Term:2      Batch: ALL**

**Time: 1.5 Hours**

**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.	<p>a) Explain how the concepts of Encapsulation, Inheritance, and Polymorphism contribute to solving real-world problems. Provide one real-world example for each concept demonstrating its application and benefit.</p> <p>b) Consider the following UML Class Diagram representing a "University System" where:</p> <pre> classDiagram     class Department {         -deptid: int         +Department(int)         +display(): void     }     class Professor {         -id: int         +Professor(int)         +display(): void     }     class Course {         -code: int         -credit: double         +Course(int, double)         +display(): void     }     Department "1..*" -- "1..*" Professor : has     Professor "1..*" -- "1..*" Course : Teach     </pre> <ul style="list-style-type: none"> <li>• A <b>Department</b> has multiple <b>Professors</b>.</li> <li>• Each <b>Professor</b> teaches multiple <b>Courses</b>.</li> <li>• Each <b>Course</b> has a <b>Course Code</b> and <b>Credit Hours</b>.</li> </ul> <p><b>Task:</b></p> <ul style="list-style-type: none"> <li>• Implement the above scenario in Java by:             <ul style="list-style-type: none"> <li>○ Defining classes Department, Professor, and Course.</li> <li>○ Establishing appropriate <b>association relationships</b> between the classes.</li> <li>○ Implementing methods to:                     <ul style="list-style-type: none"> <li>▪ Add a professor to a department.</li> <li>▪ Assign courses to a professor.</li> <li>▪ Display department details, including professors and their assigned courses.</li> </ul> </li> </ul> </li> </ul>	3  7
		CO1  CO2

	<p>[N.B. Java collection class may be used as needed or simple association]</p> <p>(Full correct implementation: 7 marks, Partial correctness: 4-5 marks, Minor issues: 2-3 marks)</p>		
2.	<p>a) Differentiate between a <b>class</b> and an <b>object</b> in Java. Provide suitable Java code snippets to illustrate your answer.</p> <p>b) Design a <b>Library Management System</b> where:</p> <ul style="list-style-type: none"> <li>The <b>Library</b> contains multiple <b>Books</b>.</li> <li>Each <b>Book</b> is associated with one <b>Author</b>.</li> <li>The <b>Library</b> manages memberships for <b>Members</b>, who can borrow multiple books.</li> </ul> <p><b>Task:</b></p> <ul style="list-style-type: none"> <li>Draw a <b>UML Class Diagram</b> covering the <b>association relationships</b> between the classes Library, Book, Author, and Member.</li> <li>Include attributes such as bookTitle, ISBN, authorName, and memberID. [assume appropriate data type]</li> <li>Indicate multiplicities for associations. [e.g. 1 to many or 1 to 1 etc]</li> </ul> <p>(Full correct implementation: 8 marks, Partial correctness: 5-6 marks, Minor issues: 3-4 marks)</p>	<p>2</p> <p>8</p>	<p>CO1</p> <p>CO2</p>
3.	<p><b>Problem Solving (Analysis &amp; Synthesis Level)</b></p> <p><b>Problem Scenario:</b></p> <p>You are tasked with designing a system for an <b>Online Shopping Platform</b>. The platform includes:</p> <ul style="list-style-type: none"> <li>A <b>Customer</b> who can place multiple <b>Orders</b>.</li> <li>Each <b>Order</b> contains multiple <b>Products</b>.</li> <li>Each <b>Product</b> has a productID, productName, and price.</li> <li>The <b>Customer</b> has details such as customerID, name, and address.</li> </ul> <p><b>Task:</b></p> <ul style="list-style-type: none"> <li>Analyze the problem specification.</li> <li>Design a <b>UML Class Diagram</b> to represent the system, ensuring correct association relationships between classes.</li> <li>Explain the multiplicity in associations and how the <b>Encapsulation</b> principle can be applied in this context.</li> </ul>	5	CO2

Good Luck