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Daffodil International University
Faculty of Science & Information Technology
Department of Software Engineering
Midterm Examination, Summer 2026
Course Code: SE323; Course Title: Software Architecture & Design
Sections & Teachers: AE (A-D, J), ST (E-F), HT (G-H), MSN (I)

Time: 1 Hour 30 Mins **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.]

A national healthcare authority is developing a Smart Healthcare Coordination System (SHCS) to support hospitals, diagnostic centers, pharmacies, ambulance services and patients across the country.

The system continuously receives information from multiple independent sources, including hospital management systems, wearable health devices, ambulance tracking systems, laboratory services, and mobile healthcare applications. These sources generate events such as emergency patient admissions, abnormal heart-rate readings, medicine shortages, ambulance requests, and laboratory test results. To support collaboration among independent organizations, all events are routed through a central service coordination mechanism. This mechanism registers healthcare services, forwards requests to appropriate providers, collects responses, and delivers relevant information to stakeholders.

The system follows a layered architecture consisting of presentation, domain, data access, and database layers. During national emergencies, the number of incoming requests increases significantly. To improve response time, some developers propose bypassing intermediate layers, while architects express concerns regarding maintainability and architectural consistency.

The authority also plans to introduce additional healthcare services in the future without affecting existing system components.

1.	a) The healthcare authority wants to ensure loose coupling among participating organizations. **Visualize** an appropriate broker architecture for the SHCS system. To generate the diagram, clearly identify the following and also explain the communication flow that helps to obtain smooth service: • Clients • Client side proxy	**[Marks-6]**	**CLO-1** **Level-2**

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	• Broker • Servers/Services • Server-side proxy		
	b) **Explain** how the broker architecture supports scalability and independent service evolution. And also, to justify this, consider the "AI Disease Prediction" service. Here you can present a diagram to show the alignment of this service with the answer of **1(a).**	**[Marks-5]**	
2.	a) Illustrate the differences between "client-server" and "shared DB" structures. You have to consider the following criteria while providing examples to justify the differences of the mentioned structures: **Case 1.** A hospital request for ambulance service. **Case 2.** The laboratory module works to store test results or medical data, and the billing module works to prepare bills for the patients, where both of these modules can view or retrieve the records stored in patientRecords.	**[Marks-3]**	**CLO-2 Level-3**
	b) The development team reports the following concerns regarding SHCS: • Doctors complain about slow response during peak hours. • Developers struggle to understand module dependencies. • System administrators need a deployment strategy for regional hospitals. • Stakeholders want to understand how emergency patient admission is processed. For each concern, **determine** the most appropriate view of the 4+1 View Model and justify your selection.	**[Marks-6]**	
3.	a) The SHCS system follows a **four-layered** architecture. **Case 1:** A patient requests laboratory test results to see the report. For this case: 1. **Analyze** the situation and discover how this situation supports or does not support architectural anti-patterns with proper justification. Here you may apply the 80%-20% rule for identification. 2. Provide a solution that allows you to reduce the impacts raised by anti-patterns with the concept of layer bridging.	**[Marks-5]**	**CLO-3 Level-4**