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Daffodil International University

Faculty of Science & Information Technology
Department of Computer Science & Engineering
Final Examination, Fall 2025
Course Code: CSE315, Course Title: Software Engineering
Level: 3 Term: 2 Batch: 64

Time: 02:00 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.]

During the COVID-19 pandemic, the Bangladesh government introduced a nationwide system designed to record and monitor vaccination activities, COVID-19 testing, and quarantine management. In this system, each citizen is registered using a unique National ID number along with a full name divided into first, middle, and last components, multiple contact phone numbers, and a complete address containing village, post office, and district. Citizens may register at various vaccination centers, where each center is identified by a unique center code, a name, and a specific location. Every vaccination center offers several types of vaccines, with each type identified by a vaccine code and name. Citizens may receive multiple vaccine doses, and each dose record includes the date of administration and the associated batch number. In addition to vaccination, citizens may also undergo COVID-19 tests at different testing centers. Each testing center has a unique ID, a name, and a location, while each test includes a test ID, the date on which it was conducted, and the test result. Citizens may also report COVID-related symptoms during follow-up calls; each symptom record contains the symptom's name and its severity level. For emergency purposes, citizens provide several emergency contacts, each with a full name, a phone number, and a description of the relationship to the citizen. The system also keeps track of healthcare workers assigned to both vaccination and testing centers. These workers are identified by employee IDs, names, and roles. Some healthcare workers serve as supervisors, and each vaccination or testing center has exactly one supervisor assigned to it. Finally, the government maintains quarantine facilities, each identified by a unique facility ID, a location, and a defined capacity, and citizens may be assigned to quarantine for specific periods.

1.	Construct a UML (Unified Modeling Language) Class Diagram based on the above description.	[10]	CO2
2.	Develop a BPMN diagram for the COVID-19 vaccination and testing process described above. The BPMN model should depict the interactions among the major participants involved in the process, including the Citizen, the Vaccination Center, the Testing Center, and the Health Authority. The process should include citizen registration, verification of National ID, selection of vaccination or testing center, dose scheduling or test scheduling, execution of the vaccination or test procedure, recording of the vaccine dose or test result, capturing of any reported symptoms in follow-up calls, and assignment to quarantine facilities when necessary.	[10]	CO2

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A telemedicine system allows patients to book virtual consultation slots. Appointment duration must be between 10 and 60 minutes, and a 10% discount applies for 20–30 minutes. Patients must be 16–90 years old, and appointments must not overlap. The system validates duration, age, discount eligibility, and overlapping bookings before generating a confirmation code.

Given the following code, apply appropriate testing techniques to answer the questions:

```
1. read(duration, age);
2. valid ← false;
3. if (duration >= 10 && duration <= 60) {
4.    if (duration >= 20 && duration <= 30)
5.       discount ← 10;
6.    else
7.       discount ← 0;
8.    valid ← true;
9. }
10. if (age < 16 || age > 90)
11.    valid ← false;
12. if (valid)
13.    conf_code ← generateCode(duration, age);
14. else
15.    conf_code ← "INVALID";
```

3.	*a)*	Analyze the appointment duration constraints and derive the Boundary Value Analysis (BVA) test cases.	[2]	CO3
	b)	Analyze the input domain of the telemedicine system and identify the valid and invalid partitions using Equivalence Partitioning (EP).	[2]	
	c)	Analyze the code and determine the minimum set of test cases required for full path coverage.	[3]	
	d)	Using black-box reasoning, construct two test scenarios to detect appointment-overlap errors and incorrect discount calculation.	[3]	

A hospital's Electronic Prescription System (EPS) has been experiencing several issues after recent updates:

- Some prescriptions fail to sync correctly between pharmacy and doctor modules.
- The system must now be migrated to a new cloud server mandated by the IT department.
- Doctors request faster loading and improved interface responsiveness.
- A security review found weak access control and risk of unauthorized data viewing.
- The development team is planning a major update of 150 KLOC.

4.	*a)*	Classify the issues into Corrective, Adaptive, Perfective, and Preventive Maintenance.	[2]	CO3
	b)	Suggest one appropriate software quality metric each for: requirement quality, code quality, and QC effectiveness.	[3]	
	c)	Determine the ethical, legal, and security issues present and analyze their impact.	[3]	
	d)	Analyze and calculate the Effort (PM) using the basic COCOMO model for the software to be embedded type.	[2]	

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