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Daffodil International University

Faculty of Science & Information Technology
Department of Computer Science and Engineering
Final Examination, Spring 2025
Course Code: CSE333, Course Title: Software Engineering
Level: 3, Term: 3

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.]***

The AI-Powered Elderly Care Monitoring System (AECMS) system consists of wearable health devices, a mobile app, and a cloud-based monitoring platform that tracks an elderly individual's heart rate, blood pressure, oxygen levels, movement patterns, and fall detection using AI-based anomaly detection. The system includes the following key functionalities, Elderly Users can wear a smart device that collects real-time health data and alerts caregivers in case of abnormalities. Family Members & Caregivers can access health records, receive emergency notifications, and adjust settings through a mobile app. Doctors can access historical health data, set medication reminders, and monitor chronic conditions. AI Algorithm analyzes behavioral patterns and detects unusual health risks. Emergency Services are automatically notified in case of a fall or critical health event.

The User class represents Elderly individuals, Caregivers, and Doctors, each with unique attributes such as ID, Name, and Contact Info to facilitate role-based access to health data. The Health Record class stores key medical metrics, including Heart Rate, Blood Pressure, Oxygen Level, and Step Count, collected through wearable health devices. The AI Analyzer class utilizes machine learning to detect anomalies in health data, triggering alerts through the Alert System when irregularities are identified. If the system detects a critical health event (e.g., a sudden drop in oxygen levels or a fall), an Emergency Alert is generated with details such as Event Type, Time, and Response Status, notifying caregivers or emergency services for immediate action. This integrated approach ensures proactive health monitoring and rapid response, enhancing elderly care and reducing medical risks.

1.		Construct the Class Diagram for Elderly Care Monitoring System (AECMS)	**[10]**	CO2
2.	*a)*	Construct a Business Process Model (BPM) for the Emergency Alert System in AECMS. The BPM should depict the step-by-step flow from health data collection, anomaly detection by AI, caregiver notification, and emergency response activation. Use appropriate BPMN elements such as events, gateways, and tasks to illustrate the process clearly.	**[05]**	CO2
	b)	Construct a Graphical User Interface (GUI) for the Caregiver Dashboard in AECMS. The GUI should include: • Real-time health metrics (Heart Rate, Blood Pressure, Oxygen Level, Step Count) • Notification panel for anomaly alerts • Emergency response button for quick action Patient profile section with past health records Ensure that the interface is user-friendly, accessible, and designed for quick decision-making in critical health situations.	**[05]**	

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3.		A university has launched an Online Course Registration System, where students can enroll in courses each semester. The system enforces rules regarding course selection, credit limits, and prerequisites to ensure students follow the correct academic path. • Students can register for 3 to 6 courses per semester. • Each course must have at least 10 students and a maximum of 50 students enrolled. • Prerequisite courses must be completed before registering for an advanced course. Test for all the following task, using Boundary Value Analysis (BVA) and Equivalence Partitioning (EP).	**[10]**	CO3
	a)	Using Boundary Value Analysis (BVA), identify the minimum set of test cases to validate course registration.		
	b)	Using Boundary Value Analysis (BVA) to determine critical test cases for course enrollment limits.		
	c)	Using Equivalence Partitioning (EP), classify the valid and invalid partitions for prerequisite checking.		
	d)	What are the edge cases using Boundary Value Analysis (BVA) if a system checks prerequisite completion based on a pass mark of 50 out of 100?		
4.	*a)*	A software firm is designing an AI-based recommendation system for an e-commerce platform. The project size is 350 KLOC, and the schedule is moderately flexible. The firm is unsure whether to classify the project as Semi-Detached or Embedded Mode. The given COCOMO parameters: • Semi-Detached Mode: a = 3.0, b = 1.12 • Embedded Mode: a = 3.6, b = 1.20 (i) Calculate the Effort (in person-months) for both modes. (ii) Compare why the estimated Effort differs between these two modes.	**[05]**	CO3
	b)	A self-driving car company is preparing to launch its newest AI-based navigation system. Internal testing reveals that in rare cases, the car may fail to detect pedestrians in low-light conditions. The management team decides to proceed with the product launch, arguing that the failure rate is statistically low. (i) As an SQA lead, Discover what testing strategies would you implement to ensure the highest safety and quality standards in autonomous vehicle software? (ii)As a software engineer, what strategies would you implement to ensure fairness, transparency, and accountability in the AI model?	**[05]**	