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Daffodil International University

Faculty of Science & Information Technology
Department of Computer Science and Engineering
Final Examination, Summer 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 Smart Home Automation System (SHAS) is a sophisticated platform designed to modernize and streamline home management. At its core, the system relies on a central hub, which acts as the brain of the operation, connecting various smart sensors and a user-friendly mobile application. The mobile app serves as the primary interface, allowing users to remotely monitor and control their home environment with ease. The system's key functionalities are driven by the interaction between these components. Users have the ability to manage connected devices, create customized automated routines, and receive critical alerts directly on their mobile phones. Sensors, which include devices for detecting motion, temperature, and light, continuously collect real-time data from the home. This data is then transmitted to the central hub for processing.

The central hub is responsible for analyzing the incoming sensor data and executing actions based on pre-programmed rules. This allows for the creation of automated routines, which are a cornerstone of the SHAS. For example, a user can set a routine to automatically turn on the lights when the sun sets or to adjust the thermostat when the temperature in a room exceeds a specific threshold. A crucial feature of the SHAS is its ability to provide timely alerts. In the event of an unusual occurrence, such as unauthorized motion detection or a smoke alarm being triggered, the system automatically sends a notification to the user's mobile app. This proactive alert system enhances both security and peace of mind by enabling users to respond quickly to potential issues. The integrated approach of data collection, processing, and user notification ensures a responsive and secure home environment.

1.		Construct the Class Diagram for the Smart Home Automation System (SHAS). The diagram should include classes for User, Device (which can be a Sensor or an Actuator), CentralHub, Routine, and Alert. Clearly show the attributes for each class and the relationships between them.	**[10]**	CO2
2.	***a)***	Construct a Business Process Model (BPM) for a User setting up an automated routine in the Smart Home Automation System (SHAS). The BPM should depict the step-by-step flow from the user opening the app, selecting a trigger (e.g., time, sensor value), choosing an action (e.g., turn on a light), and saving the routine. Use appropriate BPMN elements such as events, gateways, and tasks to illustrate the process clearly.	**[05]**	CO2
	b)	A company has a social media management tool that is facing multiple issues. First, users are reporting a bug where scheduled posts fail to publish at the correct time. Second, the company needs to integrate with a new social media platform that was not available when the tool was first developed (Adaptive). Third, the user interface feels outdated and cumbersome to use, prompting a desire for a redesign. Finally, the team wants to standardize the code to prevent future errors and make it easier for new developers to understand. Select a comprehensive maintenance plan that addresses all four of these issues. Prioritize the tasks and explain the rationale behind the prioritization.	**[05]**	

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3.		A car rental booking system has the following business rules: • A customer can rent a car for a minimum of 1 day and a maximum of 30 days. • The rental duration discount is 10% for rentals between 7 and 14 days, and 20% for rentals between 15 and 30 days. • A valid driver's license is mandatory, and it must not be expired. • The age of the customer must be between 21 and 75 to be eligible for a rental.	[10]	CO3
	a)	Using Boundary Value Analysis (BVA), identify the minimum set of test cases to validate the rental duration.		
	b)	Using Boundary Value Analysis (BVA), determine the critical test cases for the customer's age eligibility.		
	c)	Using Equivalence Partitioning (EP), classify the valid and invalid partitions for the rental duration discount.		
	d)	Test Cases for Driver's License What are the edge cases using Boundary Value Analysis (BVA) if the system checks the expiration date of a driver's license, considering that the license is valid up to and including the expiration date?		
4.	a)	A software firm is developing a new mobile banking application. The project size is 200 KLOC. The firm has two potential modes for the project: Organic or Embedded. (i) Calculate the Effort (in person-months) for both modes. (ii) Compare why the estimated Effort differs between these two modes.	[05]	
	b)	A financial software company is launching an AI-based credit scoring system. Internal testing reveals that the system may exhibit bias, disproportionately denying loans to certain demographic groups. The management team decides to proceed with the product launch, arguing that the system is more accurate on average than the existing manual process. (i) As an SQA lead, what testing strategies would you implement to ensure fairness and ethical standards in the AI model? (ii) As a software engineer, what strategies would you implement to ensure the software is transparent and accountable, especially in critical decision-making processes like loan approvals?	[05]	CO3