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Daffodil International University

Faculty of Science & Information Technology

Department of Software Engineering

Midterm Examination, Spring 2026

Course Code: SE 532; Course Title: Introduction to Robotics

Sections & Teachers: 43 (All);

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.]

1.	***a)***	A smart kitchen appliance can automatically blend ingredients based on pre-set recipes. It has no sensors to detect the environment and cannot change its behavior once started. Using the definition of a robot discussed in class, **explain** whether this appliance qualifies as a robot or not. And if this does not qualify as a real robot, suggest some modification that will make it a real robot.	**[Marks-3]**	**CLO-1** *Level- 2*
	b)	A robot arm repeatedly places components on a PCB. a. *Robot A places components very close to each other but slightly off from the target point.* b. Robot B places components scattered around the target but averages near the true location. Identify which robot demonstrates high precision and which demonstrates high accuracy and **explain** why both accuracy and precision are important in robotic assembly.	**[Marks-3]**	
	c)	A service robot in a hospital is ordered by a technician to move a heavy trolley quickly through a crowded corridor. The robot's sensors detect a high risk of collision with patients. Which of Asimov's Laws of Robotics applies most strongly in this situation? Should the robot obey the technician's order? **Defend** your answer using the laws.	**[Marks-4]**	
2.		An environmental monitoring robot is deployed in an industrial area. The robot must: • Detect rainfall to protect sensitive equipment • Measure the distance to nearby obstacles while moving • Detect the presence of hazardous gas leakage in the environment Answer question a) using this information.		
	a)	**Express** which sensors will be suitable for each requirement described in the given scenario. Classify each selected sensor as active or passive. **Prepare** the circuit for this robot for sensor data collection and **program** the necessary Arduino code to develop this system.	**[Marks-10]**	**CLO-2** *Level-3*
	b)	What is Pulse Width Modulation (PWM)? **Apply** the concept of PWM to briefly explain how PWM is used to control the speed of a DC motor.	**[Marks-2]**	

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	c)	A mobile robot uses a wheel encoder with 20 counts per revolution. The wheel diameter is 8 cm. i) **Calculate** the distance traveled per encoder count. ii) Explain what happens to distance measurement if the wheel diameter increases.	[Marks-3] 2	

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