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Daffodil International University

Faculty of Science & Information Technology

Department of Software Engineering

Midterm Examination, Spring 2025

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

Sections & Teachers: MTE(41-A,B,C,K,L), HI(41-D,E,F,M,N), MBM(41-G,H,I,J)

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 hospital has deployed an advanced humanoid robot to assist doctors and nurses with patient care. One day, the robot is ordered by a doctor to administer a high-dose medication to a critically ill patient. However, the robot's sensors detect that the dosage exceeds the safe limit, potentially harming the patient. Meanwhile, the patient is unconscious and unable to consent, and delaying the treatment could be life-threatening.			
	a)	**Give** the definition of- Sensor, Repeatability, Offset Error, Resolution, Curie-Weiss Law.	[Marks-5]	CLO-1 *Level-2*
	b)	Based on Isaac Asimov's Three Laws of Robotics, **discuss** how the robot should respond to this situation. Discuss any ethical dilemmas that arise and how they might be addressed in real-world robotic systems.	[Marks-2]	
	c)	What is the difference between proprioceptive and exteroceptive sensors in robotics? **Review** some proprioceptive and exteroceptive sensors that can be used to build the above mentioned robot.	[Marks-3]	
2.	A team of engineers is developing an autonomous agricultural robot to assist in farming operations. The robot must navigate the field, detect obstacles, adapt to weather conditions, and perform precise mechanical tasks. • While moving through the field, the robot must detect nearby objects such as rocks or other equipment to avoid collisions. • If the weather suddenly changes, the robot needs to determine whether it is raining and decide whether to continue working or return to a sheltered area. • The robot moves across the field using wheels. • A robotic arm is installed on the robot to perform precise farming tasks, such as adjusting irrigation nozzles and planting seeds.			
	a)	With proper justification, **determine** the name of the required sensors and motors for this agricultural robot.	[Marks-2]	CLO-2 *Level-3*
	b)	**Draw** the necessary circuit diagram and write the **code** required to take and visualize the input for the sensor(s) .	[Marks-8]	
	c)	**Determine** the appropriate motor for driving a robot's wheels and another for controlling a robotic arm that requires precise movement. Justify your choices and **demonstrate** their respective control mechanisms.	[Marks-5]	