BRAC UNIVERSITY

Department of Computer Science and Engineering

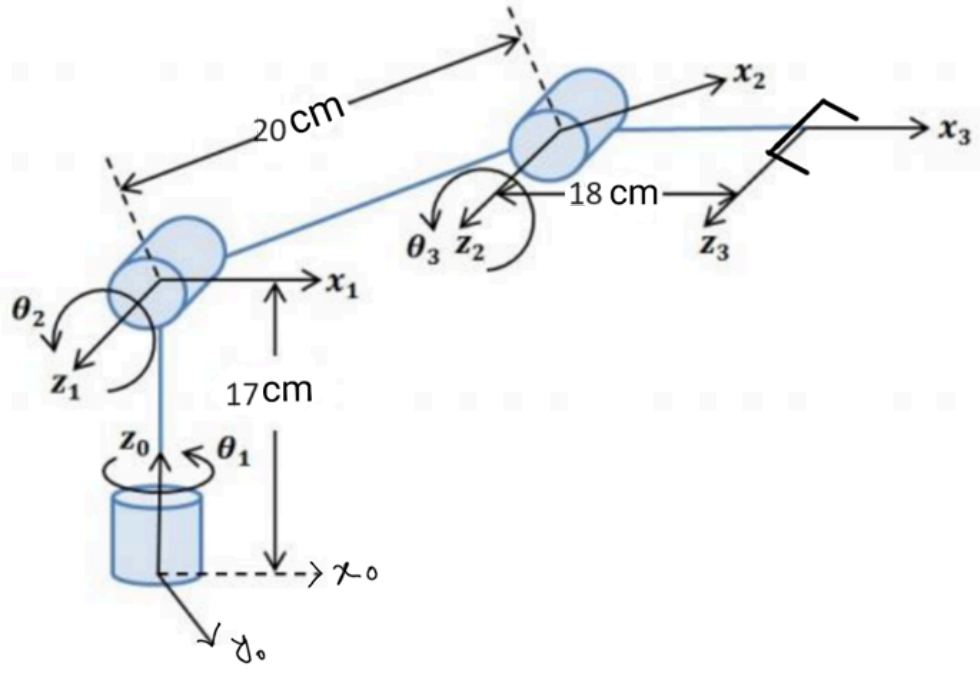**Examination:** Midterm   **Deadline:** 21 September, 2024
Semester : Summer 2024   **Full Marks:** 30

CSE 461: Introduction to Robotics

| 1. | CO1 | The Robotics Club at BRAC University is embarking on an ambitious project to integrate artificial intelligence into their robots. Excitement buzzes as members discuss the potential of creating powerful and intelligent machines for their future competitions. During a brainstorming session, a club member points out that although robotics and artificial intelligence are distinct fields, their combination can lead to groundbreaking innovations. However, the team is also aware of the potential risks, such as robots behaving unpredictably. To mitigate these risks, they agree to adhere to certain laws and checkpoints during the development phase.

a. Identify and describe the primitives of robotics when integrated with an AI agent. **[2 Marks]**
b. Explain the 4D's of robotics and explain why is it important to consider them when planning the AI-integrated projects? **[2 Marks]**
c. What laws or checkpoints must students consider when constructing the robots, and why are these considerations crucial? **[3 Marks]**
d. What are the differences between robotics and AI? Explain with an example how their integration can unlock a wide range of possibilities. **[3 Marks]** | 10 |
| 2. | CO1 | Suppose you have a start-up company and you are looking for a robotic business. You found that recently it became a trend to keep a pet like a cat. Keeping a cat as a pet is excellent but it requires caring and cleaning issues. You want to target that community group and provide some solution. You want to design some solutions that can help people to take care of pets and clean the house so that they can travel a distance without having any extra tension.
a. What kind of actuator should be used for the solution that is described in the scenario, and why, explain with comparative point of views? **[2 Marks]** | 10 |

		b. Which Sensors can be used to develop the solution Mentioned in the passage ? **[2 Marks]** c. Choose a processing device that can be used for integrating all the sensors and actuators and run the whole system. Justify your answer. **[2 marks]** d. Explain the whole system you designed for the solution using proper diagrams and illustrations. **[4 Marks]**	
3.	CO2	Consider the manipulator with 3 degrees of freedom where the waist= 17", shoulder=20", and elbow= 18". Suppose it have to pick an object from one place and drop to some other place a. If the object is placed in the coordinates 10, 20, 35 (x, y, z). What should be the angle of waist, shoulder, and elbow to pick that object? **[5 Marks]** b. To drop the object you have to further move the wrist for $6.5°$, shoulder for $2.8°$, and elbow for $8°$. Calculate the coordinates (x, y, z) where the object will be dropped after the update? **[5 Marks]**	10