2025-2026 Robotics Team

First Round of Interview Questions

Candidates are requested to select ONE question from the three departments provided (only one question to be answered instead of one question from each department). Please also note that the department chosen by the candidate is not binding and does not require the candidate to join that department after the interview. Don't worry too much if you are not confident with your answer or do not know how to answer. Just try your best!

Remarks:

1. The interview will be conducted in English.
2. The time limit is 5 minutes.

Hints:

1. Google and ChatGPT are your best friends.
2. You may use sketches, prototypes, flowcharts and/or any other tools to present your answer.

MECHANICAL

1. **Ball Placement Mechanism**

   Design a mechanism to accurately place a 10cm diameter ball into a 20cm diameter loop from variable distances (0.2–4.2m) without touching the loop. Evaluate:

   a. How would you ensure precision despite floor irregularities?

   b. Trade-offs between speed vs. accuracy (e.g., catapult vs. conveyor vs. robotic arm).

   c. Material choices for lightweight yet rigid components. (Chassis, Critical load-bearing joints, Cost vs. performance trade-offs, etc.)

2. **Climbing Sumo**

   Imagine you are designing a sumo robot (a robot car with wheels that aims to push opponents out of a circular battle area, see figure below). Your robot must climb a 3 cm platform to enter the battle area from the departure base, without altering its shape using mechanisms such as joints or arms.

   Describe your design for the robot's structure, strategy, or any other key considerations you deem important. (You may present your idea along with a brief sketch of your design.)
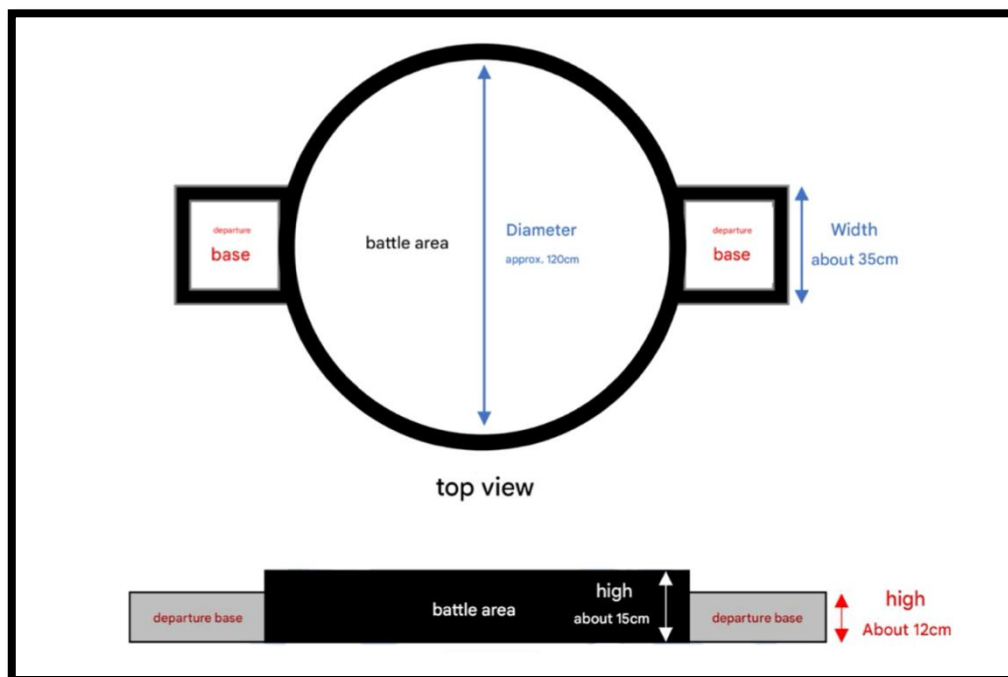
SOFTWARE

1. **Collaborative Coding**
   In a large-scale robotics project, GitHub is a popular tool for version control to facilitate collaborative development efficiently. Could you explain the specific purposes of pull, fetch, push, merge, and pull requests?

2. **System Design**
   You are designing a wheeled mobile robot to follow an 50m outdoor track. Explain the types of sensors you would integrate to accurately determine the robot's position and orientation in real time. Describe the fundamental algorithms you would employ for path tracking and evaluate your choices in terms of feasibility, reliability, and stability.
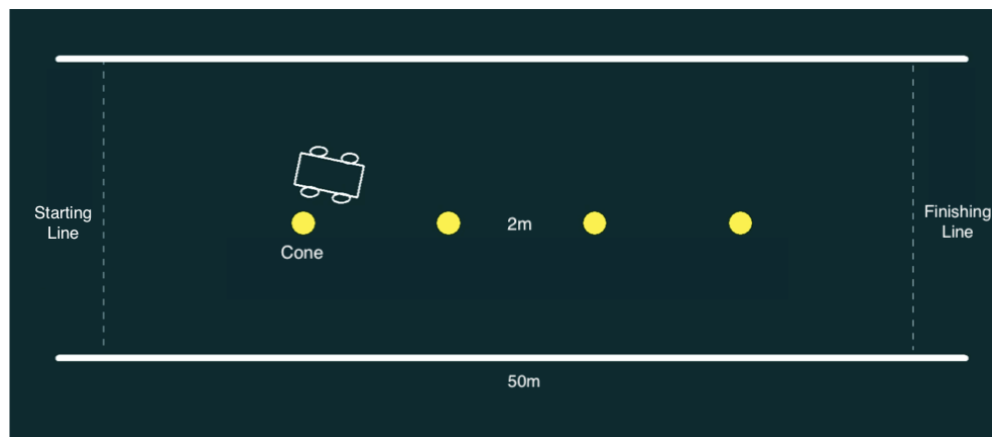
HARDWARE

1. **Circuit Design**
   What is a PCB? You are designing a circuit to step down 12V to 5V. Please specify the components, such as regulator, capacitor and resistor etc, you would use.

2. **Underwater Electronics**
   What problems may occur on the electronics part for a robot if it is required to operate underwater? Suggest a way to solve the problem.