

## Robot Rules:

- The robots must fit in a box of 25cm\*25cm (**\*any height**) area region on the ground at any instance on time.
- The robots, at any instant of time, not be aerially moving without any direct or indirect contact with the ground. (*Indirect contact is defined as contact with any solid body which supports the entire weight of the robot given that the body in question is itself in a direct or indirect contact with the ground, recursively ending with being in contact with ground.*)
- The supply robot (*referred as Robot 1 henceforth*) must be communicated with a wired media only and no other contact with the robot wireless or otherwise is allowed.
- The bridge robot (*referred as Robot 2 henceforth*) must not be able to communicate with robot 1 or any other device/person and all the necessary computing must be done onboard the robot.
- The use of non-contact sensors only is allowed robot 2, including but not limited to Camera, IR sensor, Ultrasound Sensor etc.
- You can use any type of sensors for robot 1.

## Arena Rules:

- The arena path will be of a width of 30cm if projected vertically.
- There will be no colour codes in the valley except for a black insulation tape to indicate the walls.
- The *speed breakers* in the paths of the robots are not allowed to be hard-coded. If such a case is suspected, then the competitors will have to provide the organizers with their code, and if found guilty, be disqualified.

## Scoring Scheme:

1. The team will initially have 0 points at the start. The scoring in arena will be based on an absolute scale.
  - 1.1. If the robot deviates from the path, each deviation of robot 1 causes a loss of 10 points and for robot 2, the loss is 5 points. (*Deviations include touching the walls of the valley, crossing the boundary limits or leaving the contact with ground*) (-5 pts/deviation)
  - 1.2. Every 10 seconds will lead to a decrease in the score by 2 points (-2 pts/10 sec).
  - 1.3. Once both robots reach their destinations, the team will be awarded +100 points.
2. The robots, if requires and additional run, will lose twice as many points and the rerun is allowed once only.
3. The scores based on the speed of completion are relative.
4. The fastest robot gets additional 50 points.
  - 4.1 If completion is within 20% of the best time you get additional 40 points.
  - 4.2 Till 20% more time you get additional 25 points. (Till 140% time)
  - 4.3 Every 30% excess time bags you 5 fewer points in your tally. (170%=> 20, 200%=> 15 and so on.)
5. The team with the most points at the end of the run wins the competition.

### Points granted: Example

Successful Completion = +100

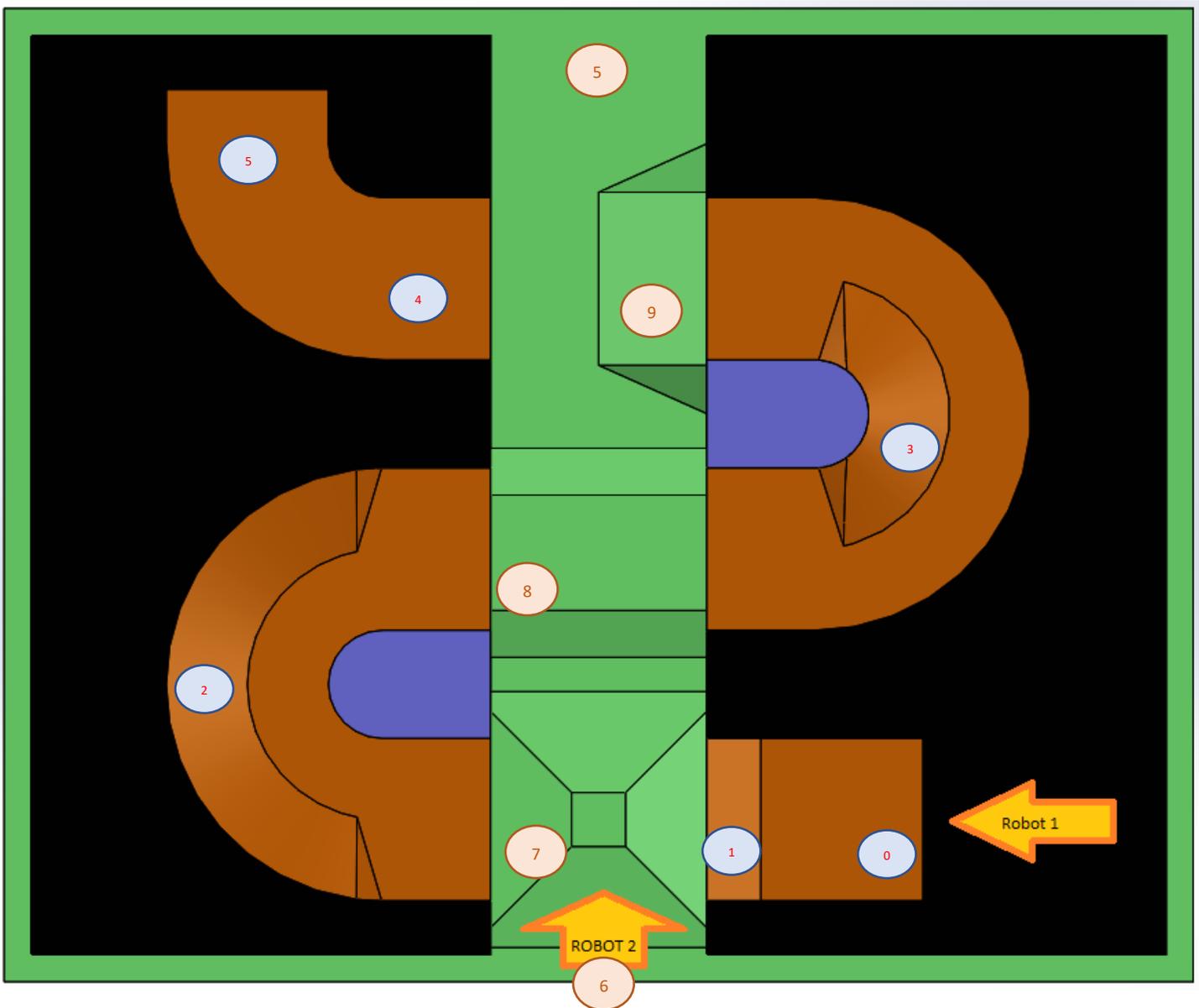
3\*Deviations =  $1*(-5) + 2*(-10)$  = -25 (1 for autonomous, 2 for remote controlled)

70 seconds for completion = -14

Best is 50 seconds = +25 (As the score is +40 till 60 seconds, +25 for 70s, +20 for 80s and so on)

**Total 86 pts.**

### Arena – Rough Sketch



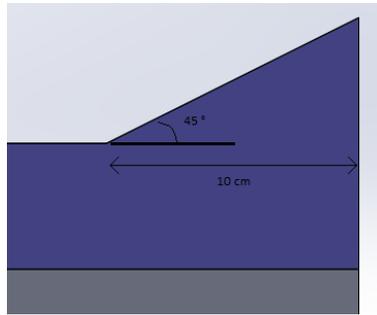
The route depicted in the picture in green is the Valley through which the autonomous robot (Robot 2) has to pass.

The route in Orange is the path to be taken by the remotely controlled robot (Robot 1).

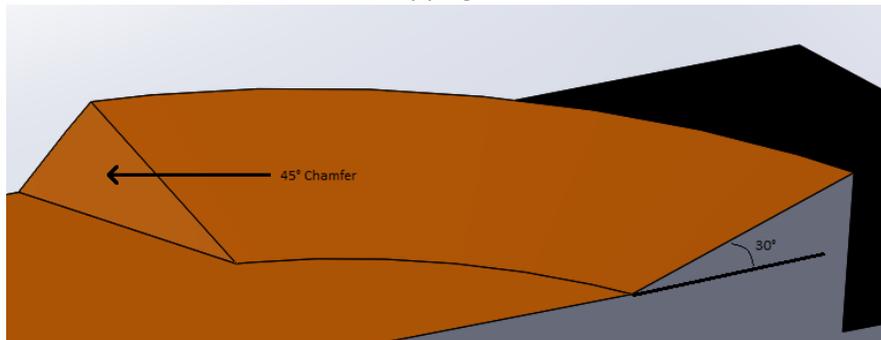
The arrows indicate the starting positions for each robot.

The valley floor is 25 cm deep w.r.t the surface of the road at position 0.

- 0 Start of Robot 1.
- 1 Slope of  $45^\circ$  angle for a length of 10 cm.

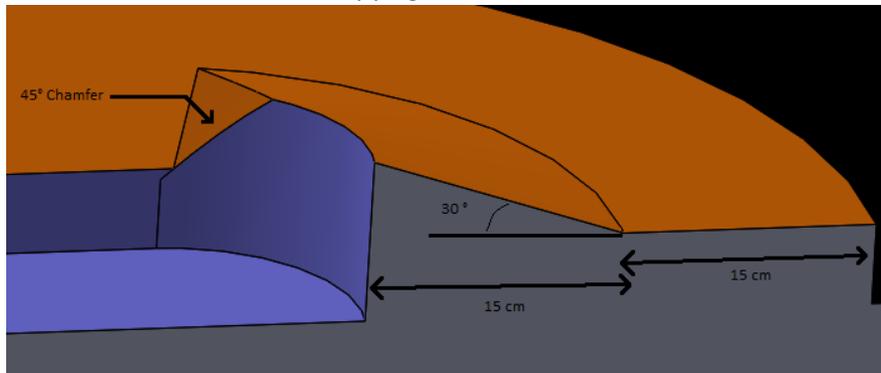


- 2 A banking of  $30^\circ$  in the inward direction occupying half the route (15 cm out of 30 cm wide route).



Turn 1 (2)

- 3 Banking on the inner surface of  $30^\circ$  occupying half the route (15 cm out of 30 cm wide route).

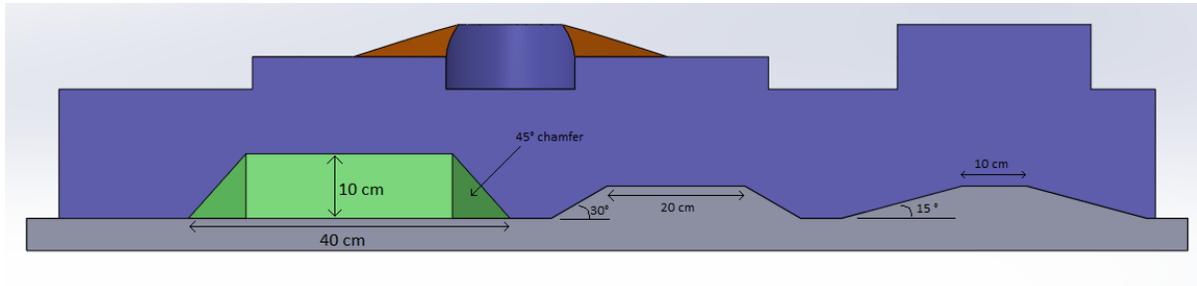


Turn 2 (3)

- 4 The end region of the route for robot 1.
- 5 END.

## Valley

- 6 Start of the route for ROBOT 2.
- 7 Frustum of a pyramid. The flat surface is of the dimensions  $10 \times 10$  cm. The height of the pyramid is 5 cm. It merges with the floor at an angle of  $15^\circ$ .
- 8 Step of 5 cm height. It merges into the valley floor at an angle of  $30^\circ$ .



- 9 There is a slope of  $45^\circ$  with the height 10 cm on half the route (20 cm wide portion of the total 40cm wide route). It merges into the floor by a chamfer of  $45^\circ$ . The total length of it at the base is 40 cm.
- 0 END

**IF YOU ARE STILL UNSURE ABOUT THE DETAILS ABOUT THE ARENA, REFER TO THE SOLIDWORKS MODEL PROVIDED ON THE COMPETITION WEBPAGE**

