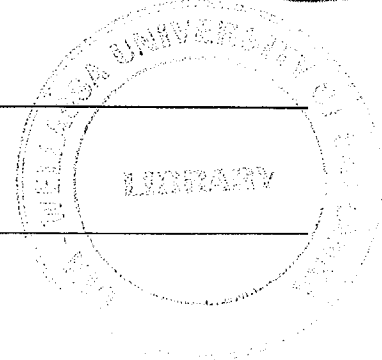


Uva Wellassa University, Sri Lanka
End Semester Examination – August/ September 2011
SCT 372-1 Mini Project



Time: One (01) hour

Answer All Questions

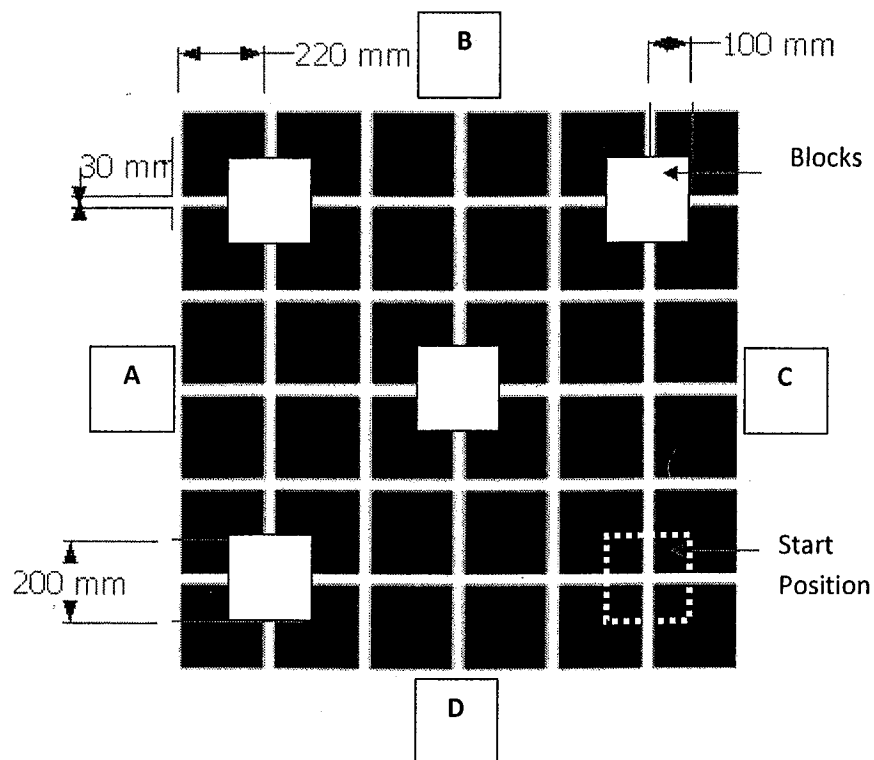
01)

You are required to design a mobile robot for the following problem

Problem Statement

Build autonomous robot which can transport blocks placed randomly on a grid, to the required locations.

(Fig. 1)



Arena Specifications

- The arena shall comprise of 6 x 6 square grids of white lines each of thickness 30 mm on a black surface. The lines will be equally spaced. Each cell of the grid will be a square with inner dimensions 220 mm x 220 mm. (See Fig. 1).
- A "Block" is a 200 mm x 200 mm x 200 mm cube. 4 such blocks will be placed randomly on the grid. Each block will be placed such that its centre coincides with the centre point of a grid intersection as closely as possible. The color of the box will be white. The block is made of non-magnetic material and weighs 45 gms.

Dimensions and Fabrication

- Each machine must fit within a square of dimensions 200mm x 200mm. No part of the machine should be outside the starting zone at the beginning of the race. There are no height constraints.
- Each machine must be stable and should be able to stand on its own at the beginning of the race when put in the start zone.
- During the run, the machine can expand itself provided it does not damage the arena in anyway. However, it is not allowed to leave anything behind or make any marks while traversing the grid. No machine can separate or split into two or more units. All machines found damaging the arena will be immediately disqualified.
- The methods of collection and delivery of the blocks are at the discretion of the builder. But use of readymade mechanical kits is not allowed.
- The designer is allowed to use micro controller boards/ sensor kits.

Power Supply and Propulsion

- The machines have to use an on-board power supply. No external power supply will be allowed.

Controls

- The machines must be completely autonomous. They should not receive any external manual help during the course of the run.

Goal

- You are required to move all four blocks to positions mark as A, B, C, and D as quick as possible.

Questions

- I. Draw the plan view of your robot which can achieve the above task clearly indicating dimensions, control board positions, power supply, motors, wheels and sensors.
(20 marks)
- II. Explain how you can estimate the position of your robot on the grid. What type of sensors can be used for the position estimation?
(20 marks)
- III. What is the sensor you can use to identify blocks? Explain reason for your selection. Draw a circuit diagram and explain how you can interface this sensor to the control board.
(25 marks)
- IV. Sketch the mechanism you intend to use to carry blocks to the final position.
(10 marks)
- V. Design an algorithm to move all four blocks to the final goal positions.
(25 marks)