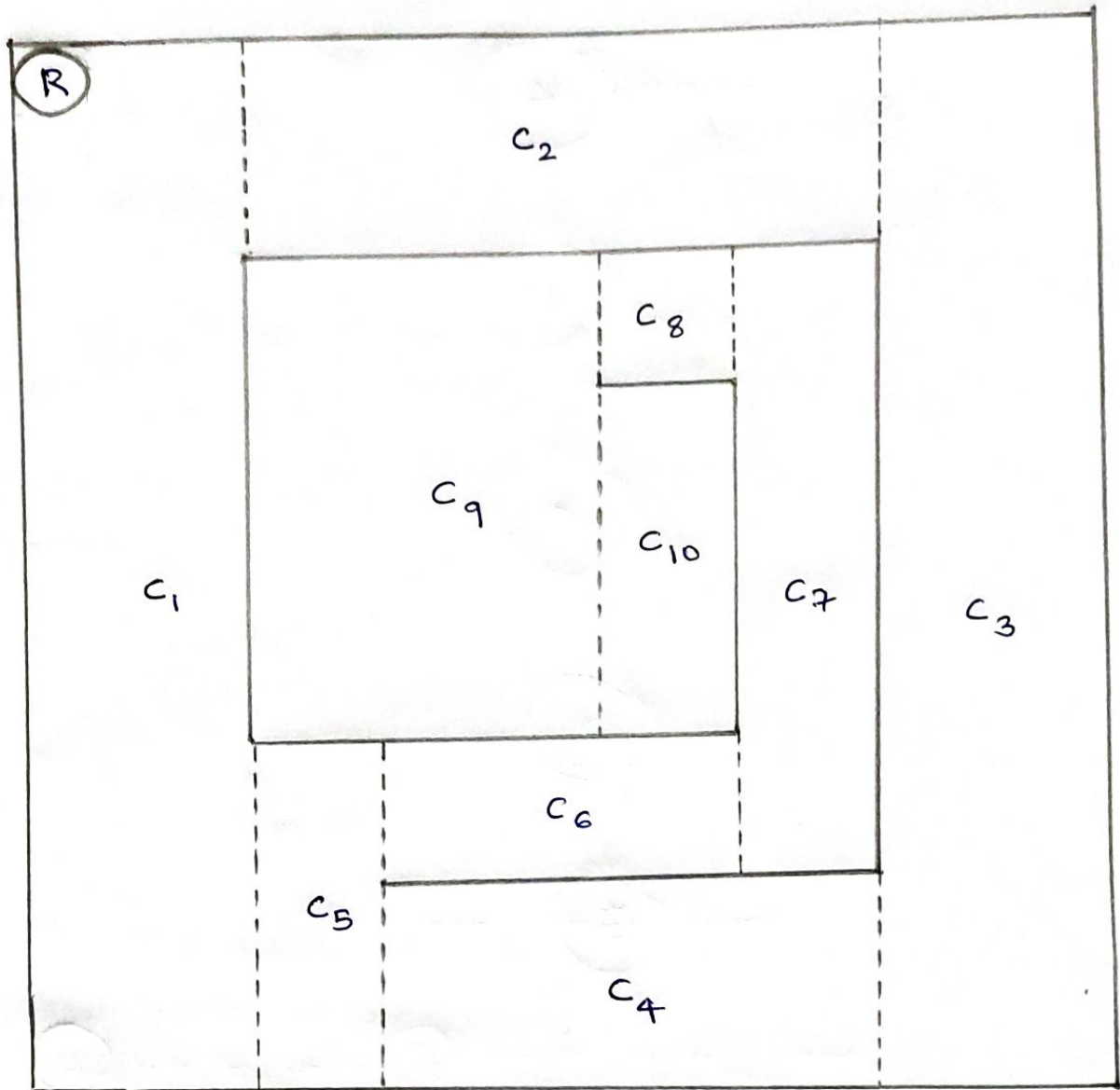


Q.1.



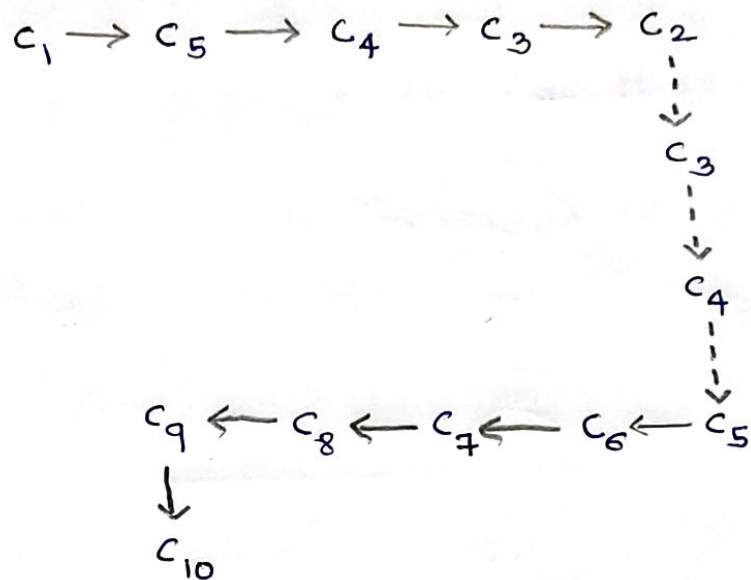
Let's assume following things:

- ① Robot is a circular in shape with diameter of 1 units, ~~where~~
- ② The arena is a 15 units by 15 units square.
- ③ The movement speed of robot is 1 unit/sec.

Now let's calculate time taken in each cell. coverage. after forming the reeb graph for the coverage

We will follow the policy of going down if there is a choice of going up or down. for the next cell.

Reeb graph:



In the above diagram ($-->$) symbol represents backtracking of the robot.

Now let's calculate time taken for complete coverage according to our assumptions.

Time of coverage of C_1 : 45 sec

Time of coverage of C_5 : 10 sec

Time of coverage of C_4 : 21 sec

Time of coverage of C_3 : 45 sec

Time of coverage of C_2 : 27 sec

Time to backtrack to C_5 : 20 sec

Time of coverage of C_6 : 10 sec

Time of coverage of C_7 : 18 sec

Time of coverage of C_8 : 4 sec

Time of coverage of C_9 : 35 sec

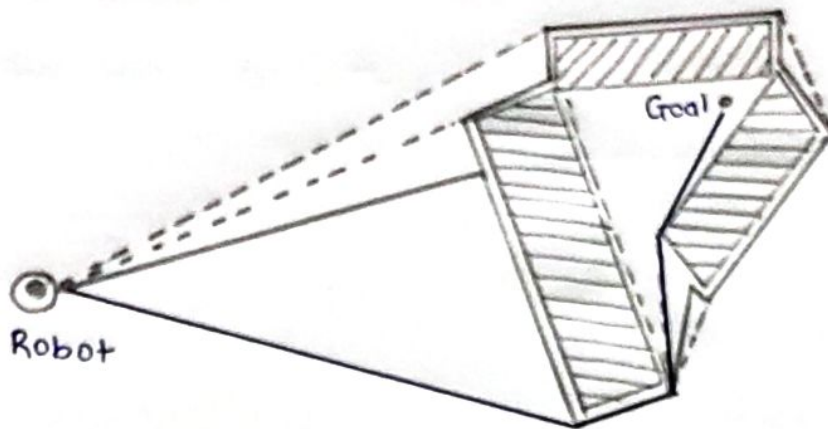
Time of coverage of C_{10} : 10 sec







\therefore Total time for coverage of area is 245 seconds.

Q. 2.

→ To reduce the time for complete coverage of the arena we can place the robot in the cell C_{10} . This helps us by not needing to backtrack and reduce the time required for complete coverage by 20 sec.

Q. 3



-  Robot
-  Goal
-  Obstacle
-  Bug's path
-  Visibility graph line
-  Shortest path.

Q.6.

→ In webots epuck robot has an emitter and receiver we can use them to send a message to other robot mentioning our next cell.

There will be a master in those two robots and if they are both going for same cell, he will emit a message asking the other guy to change its cell.