Theory Assignment 1

AI2017 ***Deadline: 27 Aug 2017***

Please do not cheat

Do not forget to write your name and roll number on your answer sheet. No queries will be entertained later regarding this.

Q1. (**3 points**) Give an PEAS and PAGE descriptions (along with any assumptions you are making) of

- **A.** Autopilot (Airplane) System
- **B.** Surgery Performing Robot
- **C.** Amazon GO

Q2. (**5 points**) DRDO has a Missile Defense System(MDS) at location (0,0), that can shoot down Enemy missiles before they hit the Defense System. The Missile Defense System consist of a Radar System and a Missile Launching System. The Radar can detect N missiles $\{M_1,M_2...M_n\}$ at a given point of time. Each missile M_i has a speed of S_i and is coming towards MDS from (X_i,Y_i). The Weapon System is a Missile Launching platform which needs to point in the direction of the target to launch the interceptor missile. Rotating the Weapon System takes time proportional to the Degree to the rotated.

Write a pseudocode of search algorithm to help to shootdown maximum numbers of Enemy Missile before they hit MDS and also analyze the Time and Space Complexity of the algorithm.

Q3. (**5 points**) Robert is playing a modified version of Snakes and Ladders where there are Snakes but no ladders. He may choose to move either by 2,3 or 6. Robert wants to find the sequence by which he can reach from 1 to 100 in minimum number of moves. N snakes (Start pos, End pos) are randomly placed on the board, whose information is given before the start of the game. Write an algorithm to help Robert print the minimum sequence of moves required to reach 100 or print -1 if 100 is unreachable and analyze the Time and Space complexity of the algorithm.

Q4. (**7 points**) Let h*(x) be the shortest distance between a state x and a goal state. Let h(.) be a heuristic that over-estimates h*(x) by at most ϵ, i.e., for all states x, $h(x) <= h^*(x)+\epsilon$. Assume that h() still assigns 0 to all goal states. Prove that A* tree search using h finds a goal state t whose cost is at most more than the optimal goal. Formally, if s is the start state and t is the goal state returned by A*, then $g(t) <= h^*(s) +\epsilon$.