1. For an arbitrary depth of memory per action, \( N \geq 3 \), write a program to simulate a Tsetlin automaton which is to interact with an environment with penalty probabilities \((c_1, c_2)\).
   (a) Test your program for \( c_2 = 0.7 \) and \( c_1 \) taking values increasing from 0.05 to 0.65 in steps of 0.1.
   (b) In each case, use the exact expression for the limiting value of \( p_1(\infty) \) (derived in class) and a binary search technique to determine the minimum number of states necessary to obtain 95% accuracy.
   (c) Submit, along with your program, the exact value of \( p_1(\infty) \) and the simulated estimated value of \( p_1(\infty) \).

2. For any one environment, compare the simulation of the Tsetlin automaton interacting with an environment with penalty probabilities \((c_1, c_2)\) with the simulation of the Krylov automaton interacting with an environment with penalty probabilities \((c_1, c_2)\).

3. For any arbitrary parameter, \( \lambda_R \ (0 < \lambda_R < 1) \), write a program to simulate the LR\(\text{I} \) automaton which is to interact with an environment with penalty probabilities \((c_1, c_2)\).
   (a) Again, test your program for \( c_2 = 0.7 \) and \( c_1 \) taking values increasing from 0.05 to 0.65 in steps of 0.1.
   (b) In each case, use the simulated expression for two initial values of \( \lambda_R \) and a binary search technique to determine the best value of \( \lambda_R \) (i.e., which leads to fastest convergence) necessary to obtain 95% accuracy. Submit, along with your program, this value and the mean time for convergence for the environment.

Your assignment should be submitted as a short formal report, with at most a couple of pages for each question. You must also submit a pointer to where we can access your code.