Assignment 4

Part 1

Write a procedure to invert a given matrix.
Example
a given matrix is [[1,2,3],[4,5,6],[7,8,9],[10,11,12]]
the inverted matrix is [[1,4,7,10],[2,5,8,11],[3,6,9,12]]

Part 2

Write grammar rules and modify the chat program to handle sentences like:

There is a meeting with John in the office at 3pm.
--> what: meeting, who: John, where: office, when: 3pm
There is a game with Boston at Skydome at 9pm.
--> what: game, who: Boston, where: Skydome, when: 9pm
There is a movie with Julia Roberts on tv at 10pm.
--> what: movie, who: Julia Roberts, where: tv, when: 10pm
Is there anything at 3pm?
--> what: meeting, who: John, where: office, when: 3pm
Is there anything at Skydome?
--> what: game, who: Boston, where: Skydome, when: 9pm
Is there any game?
--> what: game, who: Boston, where: Skydome, when: 9pm
Is there anything with Julia Roberts?
--> what: movie, who: Julia Roberts, where: tv, when: 10pm

Part 3

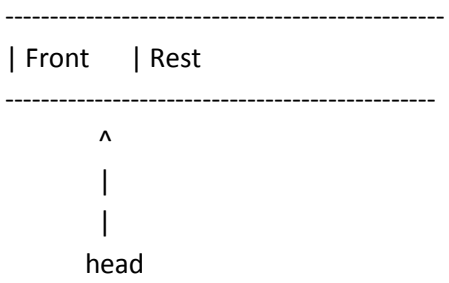
Design a Logic Program that implements a Turing Machine.
Let M=<T,I,Q,q0,b,F,d> be a Turing Machine, where:

T is the set of tape symbols,
I={0,1} is the set of input symbols
Q is the set of states
F is the set of final states
b is a special tape symbol (blank)
q0 is the initial state
d is the transition function

The main predicate of your program could be

accept(Front,State,Rest)

which is true if the Turing Machine M accepts the contents of its tape starting from state State. Assume that the tape of M is divided into two parts: Front and Rest and that the head of M reads the first symbol of Rest (as shown below).



Initially, the tape consists of Front=[] and Rest= input string.
You can use the following predicates in your program:

accept(Front,State,Rest) (defined above)
transition(State,X,NewState,X1,Move)
(true when d(State,X)=(NewState,X1,Move))

Try your program on the language
L={0^n1^n: N >=1}
The TM M with the following transitions would do the job:

transition(q0,y,q3,y,right). (which is d(q0,y)=(q3,y,right))
transition(q3,b,q4,b,right).
transition(q0,0,q1,x,right).
transition(q1,1,q2,y,left).
transition(q1,0,q1,0,right).
transition(q2,0,q2,0,left).
transition(q2,x,q0,x,right).
transition(q1,y,q1,y,right).
transition(q2,y,q2,y,left).
transition(q3,y,q3,y,right).

The description of final states of M is done
with the help of the predicate final

final(q4).