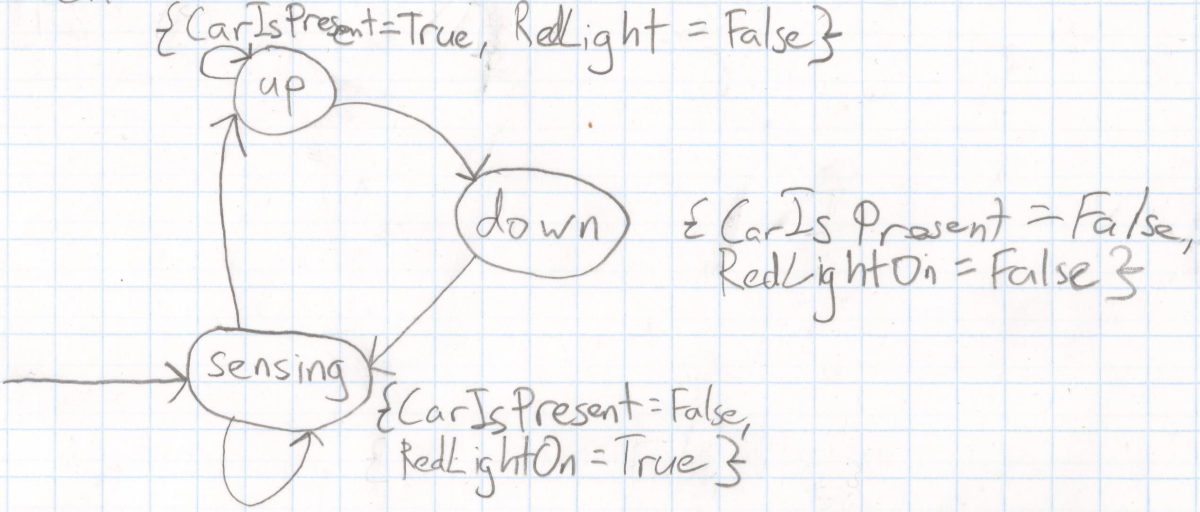
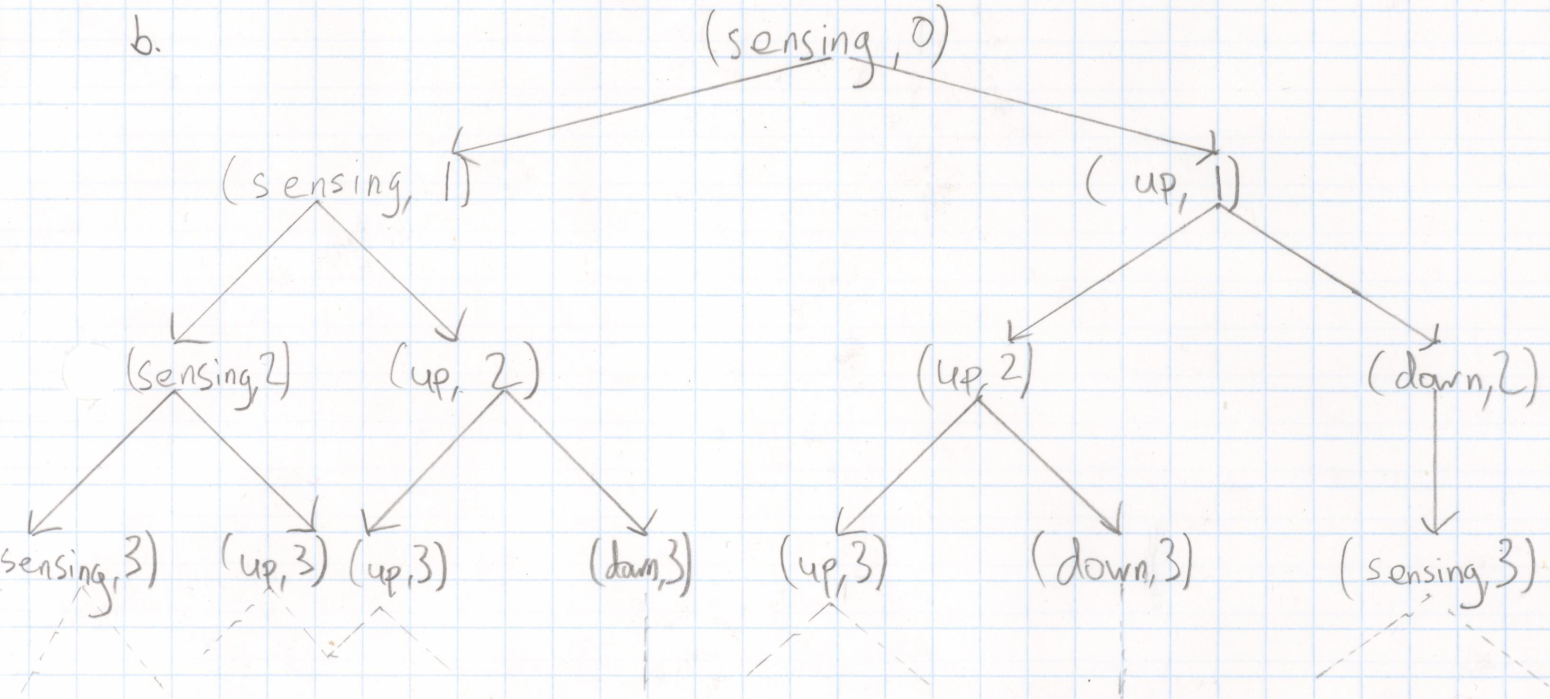
Problem 1

a.

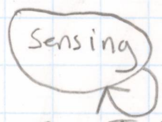


b.

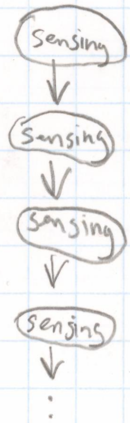


c. $\Phi_1 = AF\ CarIsPresent$

$TS \not\models \Phi_1$ since one of the paths is

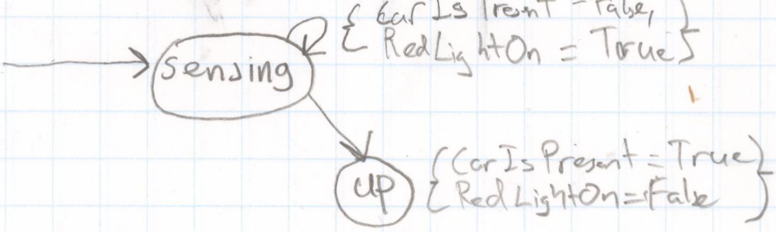


where CarIsPresent is False,



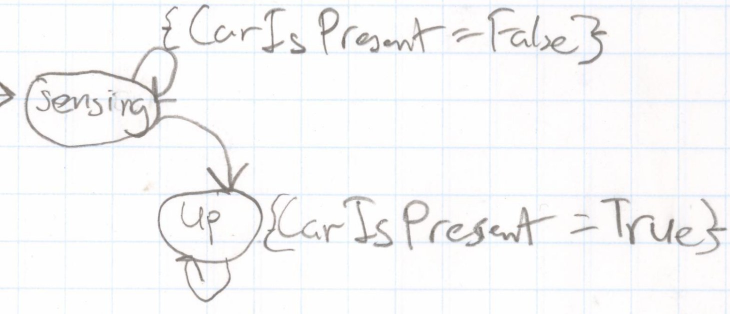
Φ_2 = EG RedLightOn
$TS \models \Phi_2$ since there exists a path whic remains on at state sensing where RedLightOn stays true.

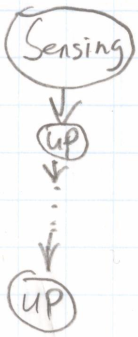
Φ_3 = AG((EF CarIsPresent) ∨ (AG RedLightOn))
$TS \models \Phi_3$ since



If the path continues just on sensing → sensing AG RedLightOn is True. If the path insted continues to up EF CarIsPresent is true since CarIsPresent at least once. This covers all paths so this covers AG

Φ_4 = AG RedLightOn ∨ EG CarIsPresent
$TS \models \Phi_4$ since
EG CarIsPresent is true.
There exists a path for which CarIsPresent remains true.





For this path CarIsPresent forever remains true.