Exercise 1

Consider the MDP $M$ as shown above. Find out the satisfaction sets of the following properties or list the probabilities of all states, give the used policies, and describe their properties:

a) $P \geq 0.5$ (a)

b) $P \geq 0.6$ (b)

c) $P \leq 0.3$ (g)

d) $Pr^M(s | (\square \Diamond a))$

e) $Pr^M(s | (\square \Diamond a \land \neg \square \Diamond b))$

Exercise 2

Consider the following objective:

$Pr^S(\Diamond G_1) \geq p_1 \land Pr^S(\Diamond G_2) \geq p_2$

Provide an MDP $M = (S, Act, P, t_{init}, AP, L)$, two subsets $G_1, G_2 \subseteq S$, and two probabilities $p_1, p_2$, such that the above objective cannot be met by any memoryless policy $\mathcal{S}$, but can however be met by a randomized memoryless policy $\mathcal{S}$! (Obviously you should provide a description of the memoryless randomized policy $\mathcal{S}$.)