PROBLEM SET 12

1. Consider a signaling game in which the Sender takes on three types: H, with probability q; M, with probability r; and L with probability $1 - q - r$. Consider a partially-pooling equilibrium in which the Sender's (pure) strategy is to send message m_1 whenever her type is H; and to send message m_2 whenever her type is M or L.

Calculate the Receiver's beliefs after receiving message m_1, and calculate the Receiver's beliefs after receiving message m_2.

2. In the job-market signaling model, specify a hybrid equilibrium in which the high-ability worker randomizes between a high level of education and a low level of education, while the low-ability worker always chooses a low level of education.

3. In the following game of ***pre-trial settlement***, there are two players: the ***plaintiff*** (the player who filed the lawsuit); and the ***defendant*** (the player who has been sued).
We have the following sequence of moves:

- First, nature randomly selects whether the plaintiff's lawsuit is strong (S) or weak (W), selecting η according to the following probability distribution, which is common knowledge:

$$\eta = \begin{cases} S, \text{ with probability } 3/4 \\ W, \text{ with probability } 1/4 \end{cases}$$

- Second, the plaintiff privately learns whether η is S or W, and chooses whether to hire a ***good lawyer*** or a ***bad lawyer***. Hiring the good lawyer costs the plaintiff \$300,000 while hiring the bad lawyer costs the plaintiff \$0.

- Third, the defendant observes whether a good lawyer or a bad lawyer was hired, and updates his beliefs as to whether η is S or W. The defendant then selects a take-it-or-leave-it ***settlement offer***, \$$p$, to make to the plaintiff.

- Fourth, the plaintiff chooses whether to accept or reject the defendant's settlement offer. If the plaintiff accepts the defendant's settlement offer of $$p$, then the defendant must pay $$p$ to the plaintiff, i.e., the payoffs are:

$$(p , -p) .$$

If the plaintiff rejects the defendant's settlement offer, then the case goes to trial (incurring additional costs for the players). The expected payoffs are determined by the following table:

Strength of Plaintiff's Lawsuit	Quality of Plaintiff's Lawyer	Payoff to Plaintiff from Trial	Payoff to Defendant from Trial
Plaintiff has strong lawsuit	Plaintiff hires bad lawyer	300,000	-500,000
Plaintiff has strong lawsuit	Plaintiff hires good lawyer	700,000	-900,000
Plaintiff has weak lawsuit	Plaintiff hires bad lawyer	100,000	-300,000
Plaintiff has weak lawsuit	Plaintiff hires good lawyer	300,000	-500,000

The payoffs displayed above do not include the cost to the plaintiff of hiring a good lawyer. If he chooses to hire a good lawyer, do not forget to take into account the additional cost of $300,000 for the plaintiff.

a. Briefly and clearly explain the relationship between this model of pre-trial settlement and the job-market signaling model.

b. Define what would be meant by a ***pooling equilibrium*** for this model, and determine whether a pooling equilibrium exists in this model of pre-trial settlement.

If one exists, calculate the equilibrium, indicating each player's decision rule and/or inferences at each move, and calculate each player's expected payoff.

If one does not exist, briefly and clearly demonstrate why none exists.

c. Define what would be meant by a ***separating equilibrium*** for this model, and determine whether a separating equilibrium exists in this model of pre-trial settlement.

If one exists, calculate the equilibrium, indicating each player's decision rule and/or inferences at each move, and calculate each player's expected payoff.

If one does not exist, briefly and clearly demonstrate why none exists.