1. Player 1 and 2 simultaneously decide whether to stay $S$ or quit $Q$. Player 2 is either weak or strong and the payoff matrices (where player 1 is the row player and player 2 is the column player) corresponding to the two types are given as follows:

$$
\begin{array}{c|cc}
S & Q & S \\
Q & 2.2 & 1.3 \\
S & 3.1 & 0.0 \\
\end{array}
$$

Weak $(1 - q)$

$$
\begin{array}{c|cc}
S & Q & S \\
Q & 2.2 & 1.3 \\
S & 3.1 & 0.2 \\
\end{array}
$$

Strong $(q)$

Find the set of pure strategy Bayesian equilibria of this game as a function of $q$.

2. Consider the extensive form game given in Figure 1:

(a) Find the set of pure strategy subgame perfect equilibria of this game when $a = 2$ and $b = 0$.

(b) Find the set of subgame perfect equilibria of this game when $a = b = -1$.

3. Consider the following bargaining game in which two players are trying to share a cake of size 1. Player 1 offers $x_1 \in [0, 1]$ and player 2 either accepts (Y) or rejects (N). If player 2 accepts, player 1 receives a payoff of $x_1$ and player 2 receives $1 - x_1$. If player 2 rejects, then player 2 moves again to offer $x_2 \in [0, 1]$. If player 1 responds by either accepting (Y) or rejecting (N). If player 1 accepts, player 1 and 2’s payoffs are $\delta(1 - x_2)$ and $\delta x_2$ respectively, where $\delta \in (0, 1)$ is the common discount factor for the players. If player 1 rejects the offer then each player receives a payoff of zero. Find the backward induction equilibrium of this game.