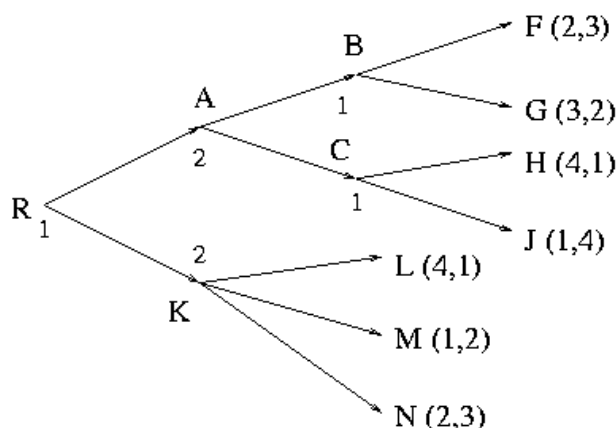
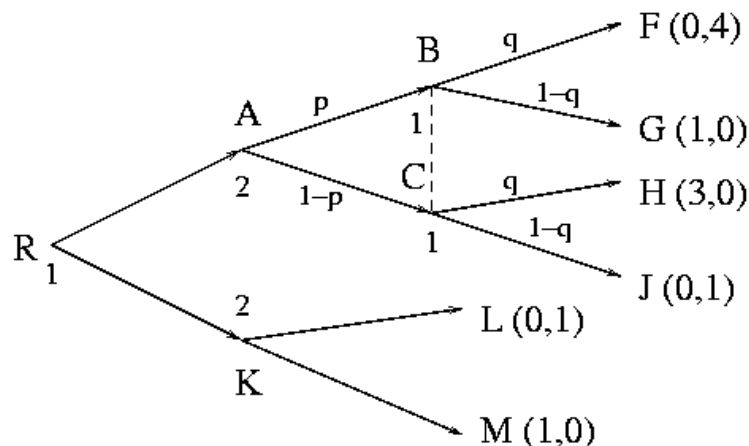


Start each problem on a new page of the blue book.

1. Consider the sequential game with perfect information given in the following game tree.
 - (a) (25 Points) Find a subgame perfect equilibrium using pure strategies. Give the decision at each node.
 - (b) (15 Points) Give a Nash equilibrium for the game that is not a subgame perfect equilibrium. Explain why your answer is correct.



2. (30 Points) Consider the sequential game with imperfect information given in the following game tree. Player one owns nodes R and the information set $\{B, C\}$. Player two owns the nodes A and K.
 - (a) Consider the subgame starting at node A. Let p be the behavior strategy for player 2 on edge AB, and let q be the behavior strategy for player 1 on the edges BF and CH. Using Bayesian consistent system of beliefs, find the values of p and q that gives the sequential equilibrium on this subgame, i.e., consider only the part of the game tree starting at node A. What is the system of beliefs for player 1 on the information set $\{B, C\}$?
 - (b) Give the Nash equilibrium for the subgame starting at node K.
 - (c) Assuming that the payoff for the sequential equilibrium for the subgame starting at node A is $\frac{3}{4}$ for player 1 and $\frac{4}{5}$ for player 2, find the sequential equilibrium for the total game. (You can use the answers for the first two parts on the subgames to obtain your answer.)



3. (30 Points) Consider the game with imperfect information where “nature” deals hands to players 1 and 2. Each player receives one card, which has probability $\frac{1}{2}$ of being an ace, A, and probability $\frac{1}{2}$ of being a king, K. Thus the probability of each of the four possible hands is $\frac{1}{4}$. Each player knows his or her own card but not the card of the other player. They can bet or fold with player 1 acting first. Assume the ante is 4 and the bet to stay in is 6 so the payoffs are as given in the following game tree. Now assume each player always bets if they have an ace. (These edges have a short line through them in the game tree below.) Let p be the behavior strategy for player 1 to bet with a king, and q the behavior strategy for player 2 to bet with a king.
- What is the expected payoff in terms of p and q for player 1 on the information set where he holds a king? (The nodes in this information set have small squares around them in the game tree below.)
 - What is the consistent system of beliefs for player 2 on the hands where she holds a king? Give the answer in terms of p . (The nodes in this information set have small circles around them in the game tree below.)
 - What is the expected payoff in terms of p and q for player 2 on the hands where she holds a king? (The nodes in this information set have small circles around them.)
 - What choice of q , $0 \leq q \leq 1$, maximizes the payoff for player 2 on the hands where she holds a king?
 - What choice of p , $0 \leq p \leq 1$, maximizes the payoff for player 1 the hands where he holds a king?
 - What is the expected payoff for the whole game for each player using the choices determined for betting with a king.

