**Homework Question**

Two players play a prisoner’s dilemma game repeatedly. There are two possible actions in each round of play, C (cooperate) and D (defect). In any round, if both players cooperate, each gets a payoff of $5 for that round. If both defect, each gets a payoff of $1 for that round. If one player cooperates and the other defects, the one who defects gets a payoff of $6 and the one who cooperates gets a payoff of $0. After each round of play, two fair coins are tossed. If both come up heads, the game ends. If the outcome is anything else, both are told what the other die on the previous round and another round is played. Total payoff to a player is the sum of the payoffs he or she earns in each round that is played.

A) If both players cooperate on every play until the game ends, what is the expected total payoff to each player? (Hints: The answer is found by summing a geometric series. What is the probability that the game lasts for at least K rounds?)

B) Suppose that Player 2 is using a “grim trigger” strategy, where he will cooperate so long as Player 1 cooperates, but if Player 1 ever defects, Player 2 will defect forever. What is the highest expected total payoff that Player 1 could get if he plays defect on the first move? Is there a Nash equilibrium in which both players play the grim trigger strategy? Explain your answer.

C) Suppose that Player 2 plays a “tit-for-tat” strategy in which he cooperates on the first move and in all later periods he uses the same action that Player 1 took on the preceding move. What would be the expected payoff to Player 1 if he played Defect on his first move and then played cooperate in all future moves? Is there a Nash equilibrium in which both players play the “tit-for-tat” strategy? Explain your answer.