Name:

The Ohio State University
Department of Economics
Econ 5001–Prof. James Peck
Fall 2017
Final Exam

Directions: Neatly write your name at the top of this page. Answer all questions and show all work.

1. (25 points) The matrix given below is the stage game of a repeated game.

player 2

		W	X	Y
player 1	A	4,4	0,0	0,0
	B	0,0	1,1	12,0
	C	0,0	0,12	10,10

(a) (12 points) Suppose that the game is played twice, and a player's payoff is the sum of his/her payoffs in the two periods. What is the highest payoff that player 1 can receive in any subgame perfect Nash equilibrium (SPNE) of the twice repeated game? Find a SPNE in which player 1 receives this payoff. Specify the strategy profile completely, not just the "equilibrium path."

(b) (13 points) Suppose that the game is played an infinite number of times, and a player's payoff is his/her average payoff across all of the periods. What is the highest payoff that player 1 can receive in any SPNE of the infinitely repeated game? You can express this payoff as a fraction if you wish. Find a SPNE in which player 1 receives this payoff. Specify the strategy profile completely, not just the "equilibrium path."

2. (25 points) Consider the following game, in which player 2 is one of two types, L or H, each of which occurs with probability one half. Player 2 observes her type before taking an action, but player 1 does not observe player 2's type. If player 2 is type L, the payoff matrix is given by

player 2, type L

player 1	X^L	Y^L
J	−2, −6	2, 0
K	0, −2	0, 0

If player 2 is type H, the payoff matrix is given by

player 2, type H

player 1	X^H	Y^H
J	−2, −2	2, 0
K	0, 2	0, 0

(a) (15 points) Convert this game of incomplete information into Bayesian normal form by constructing the relevant matrix.

(b) (10 points) Find all pure-strategy Bayesian Nash equilibria of this game.

3. (25 points) For the following Cournot duopoly, each of the two firms has a constant marginal cost of 40 per unit and seeks to maximize its expected profit. The market price depends on the outputs of the two firms and is given by

$$p = 240 - q_1 - q_2.$$

Here is the timing of the game. First, each firm observes whether or not it receives a permit to produce output. Next, the firms simultaneously produce output, with the understanding that a firm whose permit was denied must produce zero output.

The probability of a firm receiving a permit is $\frac{2}{3}$, and the probability of a firm being denied a permit is $\frac{1}{3}$. Assume that each firm observes its own type (whether it received a permit or not), but does not observe the other firm's type. Also assume that firm 1's type is independent of firm 2's type, so learning one's own type does not change the belief that the other firm has a permit with probability $\frac{2}{3}$.

Find the Bayesian Nash equilibrium of this game.

4. (25 points) Consider the following Bayesian extensive form game, where Nature moves first and q indicates player 2's beliefs about player 1's type, conditional on reaching player 2's information set.

(a) (10 points) Convert this game into Bayesian normal form by properly labeling and filling in the relevant payoff matrix.

(b) (15 points) Find all of the pure-strategy perfect Bayesian equilibria (PBE) of this game. For each PBE, briefly explain why strategies are sequentially rational and why player 2's beliefs are consistent.