Economics 204 B
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UCSC

Midterm Exam

Instructions. In class, 95 minutes, closed book except for official cheat sheet. Write your name on every page you turn in. Partial credit will be granted for brief, relevant remarks and for partial results -- if you get tangled in algebra somewhere, at least tell me what you know. **When information is insufficient**, please write down a reasonable assumption and proceed. Points as marked; total is 50.

1. You have the opportunity to invest 1 ($ million) in a startup company, which will allow it to release a beta version of its product. After seeing whether the beta version is good (z=a) or bad (z=b), you can decide whether to invest another 1 ($ million). With overall probability p(A) = .25 the company will then succeed and your gross payoff will be 7; otherwise (p(B) = .75) it will be worthless. The likelihoods of a good beta version for a product ultimately fated for success and for failure are p(a|A) = 0.9 and p(a|B) = 0.3.
   a. Compute the posterior probabilities of success (A) and failure (B) following a good (a) or bad (b) beta version. Also compute the message probabilities p(a) and p(b). (3 pts)
   b. Draw your decision tree and solve it. Write out your optimal plan. (3 pts)
   c. Now suppose that a beta version will not be available after all, and you have to decide now whether or not to invest 2; the overall probabilities and gross payoffs are unaffected. Draw and solve the revised decision tree. (2 pts)
   d. What is the information value of the beta version? (1 pt)

2. Consider the lottery L that pays 100 with probability 0.4, and pays 0 otherwise.
   a. What is the mean and variance of this lottery? (2 pts)
   b. Write down a lottery with the same possible payoffs that first-order stochastically dominates L, and another lottery (with two possible payoffs, not necessarily the same as in L) that second-order stochastically dominates L.(2 pts)
   c. What is the most that a person with Bernoulli function $u(x) = \sqrt{x}$ would pay to play lottery L? What is her risk premium? (3 pts)
   d. Compute this person's coefficients of absolute and of relative risk aversion at the mean of L. Which coefficient (if either) has the same value at x=100? (3 pts)

3. Consider the two player game described by the following payoff bimatrix.

	a	b	c
A	4,6	1,7	3,8
B	5,2	2,3	4,1
C	6,4	0,4	6,5

   a. Does either player have a dominant strategy? (1 pt)
   b. Does either player have a dominated strategy? (1 pt)
   c. Which strategy profiles survive iterated deletion of strictly dominated strategies? Explain each deletion very briefly. (2 points)
   d. Find all Nash equilibria (NE) in pure strategies, if any. (2 pts)
   e. Find all Nash equilibria (NE) in mixed strategies, if any. (2 pts)
   f. Find all payoff dominant NE and all risk dominant NE, if any. (2 pts)

Please turn over the page

4. Adrian is thinking of asking Bailey out on a date. Adrian thinks that there are three possibilities for Bailey: i) with probability p>0 Bailey is nice and likes Adrian, ii) with probability q>0 Bailey is nice, but doesn't like Adrian, and iii) with probability 1-p-q>0 Bailey is mean and does not like Adrian. (Adrian believes that a mean Bailey would like him or her with probability zero.) If Adrian doesn't ask Bailey on a date the payoff is 0 for both. If Adrian does ask Bailey then Bailey can accept or reject. If Bailey is nice and likes Adrian, the payoff vector if Bailey accepts is (5,4) where 5 is Adrian's payoff and 4 is Bailey's, while a rejection in this case gives a payoff vector of (-1,0). If Bailey is nice and doesn't like Adrian, the payoff vector from a Bailey acceptance is (4,-1), and is (-1, 0) from a Bailey rejection. If Bailey is mean and doesn't like Adrian, the payoff vector from a Bailey acceptance is (-1,-1) and the payoff vector from a Bailey rejection is (-10,2), because a mean Bailey might advertise the rejection around school and hurt Adrian's chances of getting a date with anyone else.
   a. Draw the EFG for this strategic situation. (3 pts)
   b. Write down the corresponding NFG. (3 pts)
   c. Find all pure strategy NE of the NFG. (2 pts)
   d. Find all subgames of the EFG. (2 pts)
   e. Find a (Bayesian) NE that is subgame perfect when p = 1/3 and q = 1/3. (3 pts)
   f. Find the necessary conditions on p and q for there to be a Bayesian Nash Equilibrium in which Adrian asks Bailey on a date. (2 pts)

5. a. Sketch a game form to represent the following situation: Player B chooses whether or not to tell Player A a joke that is unkind to Republicans. B is uncertain whether or not player A is a Republican. (3 pts)
   b. Now sketch a game form in which, after hearing the joke, A is uncertain whether or not B realizes that A indeed is a Republican. (3 pts)