I. Introduction

The second exam covers (i) choice under uncertainty, (ii) intertemporal choice, and (iii) game theory. I anticipate that at least half of the questions on the exam will be on the Game theory part and the rest will be on the other two parts. I will provide a short list of the basic formulae for the choice under uncertainty (expected value formulas) and intertemporal choice (present discounted value formulae), although I will not label all the terms in them. You'll have to remember how to use them. The exam will again be designed to be doable in about 40-45 minutes if you are on top of the material. (This limits the questions that I can ask.) No calculators are necessary (or permitted) during the exam. So, you will not have to solve for particular values unless they involve very simple arithmetic. You will have to show the work—e.g. steps taken to generate the results that you have—which often will just be an equation—as with the derivation of best reply functions.

A good way to study for this exam, is simply to revisit all the homework problems since the midterm or to take a look at the class/web notes and try to replicate the derivations without looking at the steps that I took.

This study guide is a source of extra practice problems, but I will not post solutions to these problems as I have for the homework problem sets and previous exam. But, I am happy to go over them during the review session.

II. Identify and/or Define (roughly 5 points each) / Matching may be done instead

In your own words, clearly and precisely define or characterize the following terms. (One or two sentences is normally enough. An equation or diagram will help in some cases.)

(a) Expected value
(b) Risk neutral
(c) Risk averse
(d) Present discounted value
(e) Discount rate
(f) Probability function
(g) Prisoner's dilemma
(h) Coordination game
(i) Assurance game
(j) Best reply function
(k) Nash equilibrium
(l) Dominant strategy
(m) Mixed Strategy
(n) Strictly Concave Function
(o) Second Order Condition
(p) Reciprocal externality
(q) Rent-seeking contest
(r) Cournot duopoly
(s) Stackelberg duopoly

III. A Few Additional Practice Problems

Intertemporal Choice and Choice under Uncertainty

(a) Suppose that you win the lottery and are to receive 50,000 $/year for the next 20 years. What is the present value of your winnings if the interest rate is 5%/year?
(b) Given you answer to part a, what is the highest price that a risk-neutral person would pay for a lottery ticket if the odds of winning are 1 in a million.
(c) Suppose that a college education (in the right field) will (on average) increase your annual earnings by $30,000 per year for the 40 years after you graduate from college. Suppose that you can graduate in 4 years. What is the present value of such a college degree when you graduate from high school, if the interest rate is 5%?
(d) Suppose, instead, that 60% of college graduates earn $40,000 per year more than the average high school graduate and 40% earn only $10,000 more per year. Repeat the above problem with these assumptions. Now discuss how risk aversion would affect your calculations.
(e) Draw a diagram that illustrates the risk premium that a risk averse person would be willing to pay to have complete insurance coverage for damages done by fire or hurricane damage.
(f) Draw a intertemporal choice diagram that illustrates the case where an individual borrows in the first period and repays the loan in the second period.

Game Theory

(a) Use a 2x2 game matrix to illustrate a PD game
(b) Use a 3x3 game matrix to illustrate a commons problem
(c) Use a 3x3 game matrix to illustrate a coordination game
(d) Assume that a lawsuit can be approximated as a lottery game. Suppose that A sues B for damages equal to $50,000. What is the Nash equilibrium of this contest if lawyers charge $200/hour?
(e) Consider a Cournot Duopoly game in which $Q_D = 20000 - bP$ and production costs are $C = cQ^2$. Find the Nash equilibrium output if there are just two firms in the industry, when the price is determined by the total quantity produced by the two firms.
(f) Repeat the previous problem with the assumption that there are 4 firms that compete in the Cournot manner.
(g) Use a Cobb-Douglas benefit function and a cost function of the form $C = aQ^b$ to characterize an externality problem between two individuals (or groups of individuals). Briefly, describe all the assumptions that you are making. Next find the best-reply functions of each person or group. Then find the Nash equilibrium of this game. Describe what you would have to do to determine whether there is an externality problem or not.
(h) Assume that two economic interest groups are attempting to get a unique trade privilege and will hire lobbyists to try to win the prize. Suppose that a lottery game can be used to characterize this contest (sometimes called a rent-seeking contest) and that the prize is worth 50,000,000 dollars (of additional profits) and that the cost of lobbyists is $500/hr. Find the Nash equilibrium of this contest.
(i) Repeat the previous problem with the assumption that there are N rivals for the special privilege rather than two.

(j) Suppose that instead of a Cournot Duopoly market (in question "e" above), it is a Stackelberg market, and the second firm will behave as if it is in a Cournot type of market (e.g. has the same reaction curve that you found when working that problem). Characterize the "first mover's" ideal choice of output.

(As usual for my study guides, the exam will consist of the "middle" range problems. The easiest problems on the study guide is easier than the easiest problems on the exam, and the hardest (and longest) are harder and longer than what will be included on the exam.)