

PLEASE READ THIS: There are three questions, and you must answer them all. The exam uses the same format at the problem sets: two numerical problems and one essay. Each numerical question is worth 20 points, and the essay is worth 30 (for a total of 70). You can therefore budget approximately one minute per point. Write your answers in a blue book. Calculators are allowed, provided of course their memory are empty of information relevant to this class. You should always show your work when calculations are involved. **PLEASE TAKE 2 MINUTES TO READ THE ENTIRE EXAM BEFORE YOU START WRITING.**

1. Welfare and Externalities (20 points total)

People want (let us assume) electric and hybrid cars because they are reliable and have low maintenance costs. That market demand is estimated to be $MPB = 100 - (5/4)Q$. Of course, they produce less pollution, which pleases the rest of the population: those benefits are said to be $MEB = 3 + (1/4)Q$. Finally, the car industry has come up with cost estimates for those electric cars: $MPC = 25 + (5/8)Q$.

- (a) (3 pts) What is the efficient, socially optimal level of car output? (denote that quantity Q^*)
- (b) (3) What output, and at what price, would a competitive market supply? (Q_c, P_c) What is the dead-weight loss? (DWL_c) Calculate and show on a graph.
- (c) (4) Using a fiscal instrument, how could government take this market from perfect competition to social optimum? Calculate the exact amount, and show on the graph.
- (d) (6) What are the changes in consumer surplus, producer surplus, total benefits/costs to third parties, and government finances if the program you suggested in 1c is implemented? What should those numbers add up to? Why? Calculate and explain.
- (e) (4) TRUE or FALSE: *"In this situation, as in any situation in which externalities are present, the dead-weight loss associated with a monopoly may be bigger or smaller than the one associated with a competitive markets."* Explain.

2. Supply of a public good. (20 points total)

Suppose you are sharing a house with three housemates (four people in total). The house comes with a television, but you live in the mountains and the only way to get any channel is to get cable. You and your housemates happen to have identical preferences when it comes to the benefits of cable-tv, *each* having a marginal benefits curve of $p_1 = 100 - 20x_1$, where x represents the number of channels to which you subscribe. The landlady controls your cable access, and she pays \$80 per year for every channel that comes in. We are considering only the coming year.

- (a) (2 pts) How would you characterize this good in terms of rivalry and excludability? Are there any mitigating factors?

- (b) (2) Calculate and graph the aggregate demand curve for cable in your house. What number of channels would maximize welfare?
- (c) (2) Suppose you and your housemates cannot agree on the number of channels to get and how to pay, but one of you breaks down and makes a deal with the landlady. How many channels would be supplied in this arrangement?
- (d) (2) Show your result from 2c on a graph, and use that graph to explain free-riding. Why will no one else buy additional channels?
- (e) (2) Suppose you have a benevolent landlady who notices how cable-deprived you are, and decides to get cable-tv viewing at its social optimum. How can she achieve that result? Calculate and explain.
- (f) (2) The landlady can now prevent people from watching cable if they don't pay, perhaps by charging admission to the living room where the tv is located. Suppose that she also turns greedy, and decides to make as much money on cable as she can from you and your housemates. How can she achieve that result? Calculate and explain.
- (g) (2) Your parents inform you they are coming to live with you and your housemates for the year. (Joy! There are now 6 people in the house) They *each* have preference $p_2 = 200 - 100x_2$ for cable. What is the new aggregate demand?
- (h) (6) What should your landlady's new profit-maximizing strategy be in terms of channels supplied and people served? On what crucial piece of information does this depend on? How important is the number of people in each group? If you don't have time to calculate everything, at least provide some intuition.

3. Essay (30 points).

In the first part of this semester, we have often considered the case of a negative externality such as pollution. Typically, we drew an output graph (P, Q) with marginal benefits, marginal private cost and marginal social costs. We then discussed ways of moving from an unregulated market situation, either perfect competition or monopoly, to the efficient outcome. In the simplest cases, we have seen that unit taxes, quotas ("standards"), or transferable permits can all get us to that social optimum.

Discuss **three** models which might make you prefer one over the other(s). You can use, if you want, graphs and numbers to illustrate your arguments. The most important thing is to be as clear, logical and informative as you can, given the time constraint (*is it binding?*). You will not be judged on the extent of your vocabulary, but we do appreciate (and reward) complete sentences.