Midterm

Instructions: Please remember to write your name and Student ID# on your bluebook. Answer all questions. Each question should start on a new sheet of paper and should be well marked!!!. Page limits are there to help you, remember to manage your time during the exam. Each question will have equal points. Good luck!

Part 1: Market Structure and Externality

City of Emeryville hired two top students at EEP101 to investigate the project of Emeryville Mall. After a semester hard work, they gathered the following information, and have two proposals to the Committee.

- The private marginal benefit $MPB$ and the marginal cost $MC$ are given by $MPB = 320 - 2Q$ and $MC = 40 + 3Q$ where $Q$ is the number of shops in Emerville Mall.

- This project will cause negative externality such as traffic congestion, noise pollution, and etc. It also generates positive externality. For example, it may be good for the housing market since life is much more convenient with a big shopping mall in the neighborhood. To summarize, the net external marginal benefit is $MEB = Q$.

1. Numerical Questions

   (a) **Proposal One**: Assume it is a competitive market, find out the optimal number of shops in Emeryville Mall $Q_c$ and the optimal price $P_c$; and the total social welfare and deadweight loss in comparison with the social optimality.

   (b) **Proposal Two**: Assume a middleman operates Emeryville Mall. This middleman buys the future mall from the city, and sells to potential owners. Find out the optimal number of shops in Emeryville Mall $Q_o$, price this middleman pays to the city $P_{o1}$, price potential owners pay to this middleman $P_{o2}$; and the total social welfare and deadweight loss in comparison with the social optimality.

2. Essay Question

   True or false, and comments on the following argument:
   A monopoly always creates a greater deadweight loss than a competitive market in presence of an externality (**less than one page, and use diagrams**).
**Part 2. Technology adoption.**

The following is an excerpt from an article about Professor Zilberman’s latest research.

GENETICALLY modified cotton is bringing dramatic benefits to poor farmers in India, transforming yields while cutting pesticide use, a major series of field trials has revealed.

Small-scale, low-income farmers who grew the GM crop had extraordinary yield increases averaging 80 per cent, suggesting that the technology has the potential to revolutionize agriculture in the developing world. The study, which is the first to examine the effects of GM cotton when grown in conditions typical of most developing countries, also indicates that the crop will carry substantial environmental benefits. Fields sowed with the transgenic cotton had to be sprayed with pesticides only a third as often as conventional varieties, while the huge boost to yields should prevent the clearing of wilderness for farmland and pasture.

"Many critics have questioned whether genetically modified crops would be economically and environmentally beneficial to farmers in developing countries," said David Zilberman, Professor of Agricultural and Resource Economics at Berkeley, a leading author of the study. "Our research indicates that transgenic crops should be a viable option. This is the first paper to show such a substantial increase in yield for bioengineered crops." The yield improvements, indeed, were considerably greater than those seen in more extensive cotton farms. Most insect-resistant cotton crops in the US and China have had yield gains of less than 10 per cent, largely because conventional insecticides are already used to control bollworms.

I. Quantitative Part.

Suppose you are provided with the following data:

<table>
<thead>
<tr>
<th></th>
<th>Traditional cotton</th>
<th>Genetically Modified cotton</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed cost of seeds</td>
<td>60</td>
<td>280</td>
</tr>
<tr>
<td>Input use efficiency of fertilizer</td>
<td>.3</td>
<td>.1</td>
</tr>
<tr>
<td>Output (cotton) price</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>Fertilizer price</td>
<td>10</td>
<td>10</td>
</tr>
</tbody>
</table>

The production function is \( f(a, h_i) = [h_i * a]^{1/2} \), where \( a \) is fertilizer and \( h_i \) is input use efficiency.

Find how much the lump sum subsidy needs to be for farmers to switch to the new technology. Under which technology is output greater?

II. Essay Part.

Briefly address the following issues in a brief essay (you should only need a few paragraphs):

(a) What do you think are two economic and environmental reasons to criticize GM in developing countries? Why does the yield increase in David’s research, you think, surpass that of the US?

(b) Is it necessarily a fact that input-use-conserving technologies lead to input savings? Provide a graph of the value of marginal product of traditional and GM technology in applied-input and input-price space.
Part 3. Public Good

Welcome to Despair City, population 10. The residents of Despair would like you to help them visit their friends in Bliss City. Each of the ten citizens of Despair has a utility function that depends only on the number of times they get to visit their friends in Bliss, \( U(Q) = 10Q - 0.25Q^2 \). However, traveling from Despair City to Bliss City entails crossing the Pit of Despair, which is currently impossible without a bridge. Assume that the construction costs of a bridge are $630.

A) The citizens are trying to decide whether or not to build a bridge across the pit. One of the biggest debates is whether or not a bridge is a private or public good. What aspects of a bridge are a public good? And private? What do you think, is a bridge more of a public or a private good?

B) One of the members believes that the bridge is a public good and proposes forming a bridge-coop to finance the construction of the bridge. The cooperative will work as follows: all members of the cooperative donate a one-time lump sum to equally split the construction costs of the bridge. Then, the bridge to Bliss City will be freely available for everyone to use as much as they like. If all ten residents join the cooperative, what is the total Consumer Surplus generated by the bridge? Now imagine that you are the 10th resident of Despair, and all other nine residents have joined the cooperative. Is there an incentive to not join the cooperative? Explain why, or why not.

C) ACME Bridge, a private firm, is contemplating building the bridge across the pit and operating it as a monopoly and charging toll-access to finance the bridge construction costs (Assume that it is costless to enforce the tolls, that is, the firm does not have to pay anyone to act as the toll booth agent). What is the highest construction cost that the firm is willing to pay in order to build the bridge? How does this result compare to how much the cooperative would be willing to pay for the bridge? Explain the difference between the two, using the concept of public vs. private goods.