All Syracuse University policies and procedures concerning academic honesty apply to this course:

"Syracuse University students shall exhibit honesty in all academic endeavors. Cheating in any form is not tolerated, nor is assisting another person to cheat. The submission of any work by a student is taken as a guarantee that the thoughts and expressions in it are the student's own except when properly credited to another. Violations of this principle include: giving or receiving aid in an exam or where otherwise prohibited, fraud, plagiarism, the falsification or forgery of any record, or any other deceptive act in connection with academic work. **Plagiarism is the representation of another's words, ideas, programs, formulae, opinions, or other products of work as one's own either overtly or by failing to attribute them to their true source.**" (Section 1.0, University Rules and Regulations)

**WARNING!!!**

While homework problems may have been done cooperatively, exams are individual work. **Do not** communicate about this exam with anyone except the instructor [x3-2345 or e-mail to jskelly@maxwell.syr.edu]. **Violation of this rule will result in a grade of 0 for the exam.** Any notices will be sent to you by e-mail; **check occasionally.**

**EXPLAIN** your answers carefully.

*Keep a Xerox copy of your answers to the exam*

Take-home portion DUE: Noon, Tuesday, May 8th.
EXPLAIN your answers carefully.

1. (Screening) [25 points] There are two worker types, H and L, high and low productivity, present in equal numbers, with parameters $\theta_L = 1$ and $\theta_H = 3$. For wage $w$ and task level $t$,

$$U_i = w - C(t, \theta_i)$$

$$= w - \frac{t^2}{\theta_i}$$

Productivity depends positively on task level: $P_i = \theta_i + t$. The proportion of all workers of L-type is $\lambda$, where $0 < \lambda < 1$.

A. Does there exist a pure pooling screening equilibrium?

B. Does there exist a mixed screening equilibrium with half of the workers of each type pooled and half separated?

C. Does there exist a pure separating screening equilibrium?

(Worry about pooling contracts that could break separating “equilibria,” but not about splitting contracts.)

2. (Moral hazard - Comparative statics) [25 points]

Redo the analysis of insurance with moral hazard but now where an individual faces unemployment with fixed probability .20 rather than .25. All other functions and parameters remain the same.

3. (Optimization) [25 points]

Let $F(x,y)$ be any continuous function on $\mathbb{R}^2$ to $\mathbb{R}$ and, for some constant $c$, let $S$ be the set

$$S = \{(x,y) : F(x,y) \geq c\}$$

Consider the problem of finding the point in $S$ closest (i.e., minimum Euclidean distance) to the origin, $(0,0)$. Show that whenever $S$ is non-empty, this problem has a global minimum.
4. (Public goods mechanism design) [25 points]

Individuals have quasilinear preferences given by \( u_i(x, \theta) = k\theta_i + (m_i + t) \). All \( \theta_i \) are non-negative; all \( m_i \) are positive.

**Revelation mechanism with income-based tax:**

With messages \( b = (b_1, ..., b_i) \):

Choose \( k(b) = 1 \) if \( \Sigma b_i \geq c \); 0 otherwise.

\[
t_i(b) = -\left(\frac{m_i}{\Sigma m_i}\right) c k(\bar{\theta})
\]

Assume \( \Theta_i = \{\theta_i\} \) for \( i \neq 1 \); \( \Theta_1 = \mathbb{R} \).

**A.** Show, by an example, that for some values of \( m_1, ..., m_i, c, \theta_1, ..., \theta_i \), individual 1 has an incentive to understatement his preference for the public good, by choosing \( b_1 < \theta_1 \). Extra points for an example where this causes \( \Sigma b_i < c \) even though \( \Sigma \theta_i \geq c \).

**B.** Show, by a different example, that for some values of \( m_1, ..., m_i, c, \theta_1, ..., \theta_i \), individual 1 has an incentive to overstatement his preference for the public good, by choosing \( b_1 > \theta_1 \). Extra points for an example where this causes \( \Sigma b_i \geq c \) even though \( \Sigma \theta_i < c \).

*EXPLAIN* your answers carefully.