Tutorial 11 – Final exam practice

1. Carol makes specialised components for Amy. The value of these components to Amy depends on their quality, summarised by the number q. In particular, Amy earns profits

$$\pi_A(q) = V(q) - P$$

$$V(q) = 100q - 1000$$

where P is the price Amy pays Carol for components. In order to supply components of quality q to Amy, Carol must first make a costly investment in quality. Carol earns profits

$$\pi_C = P - I(q)$$

$$I(q) = q^2$$

Carol is only able to sell the components she makes to Amy. No other firm is interested in them.

(a) Suppose Carol has already made an investment of quality q at a cost of $I(q)$. What possible values for P might Carol and Amy accept? Explain.

(b) How does the likely price P determine Carol's initial incentive to invest in quality? Explain.

(c) Suppose Carol and Amy write a contract before Carol invests. The contract specifies a price that depends on quality, $P(q)$.

i. If q is observable and verifiable, describe an optimal contract, $P(q)$. How much does Carol invest?

ii. Suppose q is imperfectly observable. How would this impact Carol's incentive to invest?

Explain.

2. The revenue generated by a computer salesperson is given by:

$$Q = e + u$$

where *e* is their sales effort, and *u* is a random shock, beyond their control. The cost of effort is $C(e) = 2e^2$. The firm offers a linear salary contract:

$$S = a + bQ$$

1. Suppose u = 0. what are the optimal values of a, b, e? Interpret.

2. Suppose $u \sim (0, \sigma^2)$, and the worker's preferences are

$$U(e, S) = E(S) - 0.5\theta Var(S) - C(e)$$

where *E*(*S*) and *Var*(*S*) are the expected value and variance of salary.

a. What is the variance of the worker's salary, S?

b. What is the worker's utility maximising problem?

c. What are the optimal values of a, b, e? Interpret.