Question 1

(a) There is only a mixed strategy Nash equilibrium. Let p be the probability that you pay. Then the University must be indifferent between enforcing and not enforcing, i.e., p(10-c) + (1-p)(20-c) = 10p. Therefore, p = (20-c)/20. The University's profit is therefore,

The expected payoff of the University is $10p = 10^{-1}$	$\frac{20-c}{2} = 10 - 0.5c$
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(b) Now it is optimal for you to always pay. Therefore,

The expected payoff of the University changes by -0.5c

Question 2

(a) The price elasticity of demand is $\epsilon_P = \frac{10p}{10p-1000} = \frac{p}{p-100}$. Marginal costs are 20. Thus, $20 = p\left(1 + \frac{p-100}{p}\right) = p + p - 100$. Thus, **The firm will charge a price** p = 60

Demand is D(60) = 400. Thus, revenue is 24,000. Costs are c(400) =13,000. Thus,

The firm's profit is 11,000

Individual demand is Q = u/100 = 400/100 = 4. Thus, an individual consumer spends 240 Dollars, which implies that m = 10,000 - 240 = 9,760. Thus, utility is u(4, 9760) = 10,080.

A consumer's utility is 10,080

(**b**) Now marginal costs are 30. Thus, $30 = p\left(1 + \frac{p-100}{p}\right) = p + p - 100$.

The firm will charge a price p = 65

Demand is D(65) = 350. Thus, revenue is 22,750. Costs are c(350) =15,500. Thus,

The firm's profit is now 7,250

The government's total tax revenue is 3,500

Individual demand is Q = y/100 = 350/100 = 3.5. Thus, an individual consumer spends 227.50 Dollars, which implies that m = 10,000 - 227.50 =9,772.50. Thus, utility is u(4,9760) = 10,080.

A consumer's utility is 10,061.25

Thus, each consumer's utility loss is 18.75. Given that there 100 consumers, total loss is 1,875. The firm loses 3,750. The tax gain is 3,500. Thus,

The dead weight loss generated by the tax is 2,125

Thus, for each Dollar of taxes raised, the loss is 60.7 cents

Question 3

(a) The manager maximizes $0.05(100e - e^2) - 2e$. This expression is maximized when the derivative is 0, i.e., 5 - 0.1e - 2 = 0, which implies e = 30. The owner's profit is therefore $0.95(100e - e^2)$. Therefore,

If s = 0.05, the owner's payoff is 1,995

If s = 0.1 then the manager maximizes $0.1(100e - e^2) - 2e$. Again, this expression is maximized when the derivative is 0, i.e., 10 - 0.2e - 2 = 0, which implies e = 40. A consumer's profit is therefore

If s = 0.1, the owner's payoff is 2,160

(b) The optimal *e* is determined by taking the derivative with respect to *e* of $0.05(100e - e^2 + 400\sqrt{t}) - 2e - t$, which yields again e = 30. The optimal *t* is determined by taking the derivative with respect to *t*. Therefore, $0.05(200/\sqrt{t}) = 1$, which implies t = 100. Therefore, the manager receives $0.05(f(30) + 400\sqrt{100}) = 305$. The owner's profit is f(30) - 305, i.e.,

If s = 0.05, the owner's payoff is 1,795

If s = 0.1 then the optimal *e* is determined by taking the derivative with respect to *e* of $0.1(100e - e^2 + 400\sqrt{t}) - 2e - t$, which yields again e = 40. The optimal *t* is determined by taking the derivative with respect to *t*. Therefore, $0.1(200/\sqrt{t}) = 1$, which implies t = 400. Therefore, the manager receives $0.1(f(40) + 400\sqrt{400}) = 1,040$. The owner's profit is f(40) - 1,040, i.e.,

If s = 0.1, the owner's payoff is 1,360

Question 4

(a) The *h* worker is indifferent if $\sqrt{40,000} + \sqrt{40,000} = \sqrt{m} + 0.6\sqrt{m}$. Therefore,

(b) Now
$$\sqrt{32,400} + \sqrt{32,400} = \sqrt{10,000} + 0.4\sqrt{40,000} + 0.6\sqrt{m}$$
. Therefore,
 $m = 90,000$

Question 5 The price elasticities of demand in A and B are given by

$$\epsilon_A = -\frac{p}{100 - p} = \frac{p}{p - 100}, \quad \epsilon_B = -\frac{10p}{120 - 10p} = \frac{p}{p - 12}.$$

Therefore,

$$10 = p_A \left(1 + \frac{p_A - 100}{p_A} \right) = p_A + p_A - 100,$$

which implies:

In country *A* the price is
$$p_A = 55$$

In country B,

$$10 = p_B \left(1 + \frac{p_B - 12}{p_B} \right) = p_B + p_B - 12,$$

which implies:

In country *B* the price is $p_B = 11$

Note that $y_A = 45$ and that $y_B = 10$. Therefore, y = 55. Total costs are c(55) = 550 + 220 = 770. Therefore, ATC = 14. Therefore,

Profit/unit, i.e., p - ATC = -3

Question 6 Marginal costs are 180. Thus, 180 = p(1 - 1/1.5) = p/3. Thus, p = 540. After the entry, 180 = p(1 - 1/4) = 3p/4. Thus, p = 240.

NW lowers the price from \$540 to \$240.

Question 7 The equilibrium is D, R. Therefore,

In the Nash equilibrium A's (expected) payoff is 3

Question 8

(a) The overall probability that a person becomes ill is 0.01(0.9) + 0.2(0.08) + 0.9(0.02) = 0.043. Thus, the expected costs are 0.043(20,000) = 860 per person. Average fixed costs are 6 Dollars. Thus,

The insurance premium is \$866

(b) In order for everyone to sign up, the insurance company can charge at most \$300. The expected costs per person are \$860. Thus, profit is 300,000,000-860,000,000, i.e., -566 Million.

Alternatively, they company could charge \$6,000 in which case only *B* and *C* will sign up. The probability of an illness is (0.2(0.08)+0.9(0.02))/0.1 = 0.34.

Thus, expected costs per person are 6,800. There are 100,000 type *B* and *C* people. Thus, profit is -86 Million.

Finally, at a premium of 18,200 only type C sign up. Profit is -2 Million.

The insurance premium is 18,200

The insurance companies' total profit is -2 Million

0% of the population will be insured.