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., $p(5-c)+(1-p)(15-c)=5p$. Therefore, $p=(15-c)/15$. The University's profit is therefore,

The expected payoff of the University is $5p = \frac{15-c}{3} = 5 - \frac{c}{3}$

(b) Now it is optimal for you to always pay. Therefore,

The expected payoff of the University changes by $-\frac{2}{3}c$

Question 2

(a) The price elasticity of demand is $\epsilon_P = \frac{10p}{10p-1000} = \frac{p}{p-100}$. Marginal costs are 40. Thus, $40 = p\left(1+\frac{p-100}{p}\right) = p + p - 100$. Thus,

The firm will charge a price $p = 70$

Demand is $D(70) = 300$. Thus, revenue is $21,000$. Costs are $c(300) = 13,000$. Thus,

The firm's profit is 8,000

Individual demand is $Q = y/100 = 300/100 = 3$. Thus, an individual consumer spends 210 Dollars, which implies that $m = 10,000 - 210 = 9,790$. Thus, utility is $u(3, 9790) = 10,045$.

A consumer's utility is 10,045

(b) Now marginal costs are 50. Thus, $50 = p\left(1+\frac{p-100}{p}\right) = p + p - 100$.

The firm will charge a price $p = 75$

Demand is $D(75) = 250$. Thus, revenue is $18,750$. Costs are $c(250) = 13,500$. Thus,

The firm's profit is now 5,250

The government's total tax revenue is 2,500

Individual demand is $Q = y/100 = 250/100 = 2.5$. Thus, an individual consumer spends 187.50 Dollars, which implies that $m = 10,000 - 187.50 = 9,812.50$. Thus, utility is $u(4, 9812.5) = 10031.25$.

A consumer's utility is 10031.25

Thus, each consumer's utility loss is 13.75. Given that there 100 consumers, total loss is 1,375. The firm loses 2,750. The tax gain is 2,500. Thus,

The dead weight loss generated by the tax is 1,625

Thus, for each Dollar of taxes raised, the loss is 65 cents

Question 3

(a) If $s = 0.05$ then the manager maximizes $0.05(50e - e^2) - e$. Again, this expression is maximized when the derivative is 0, i.e., $2.5 - 0.1e - 1 = 0$, which implies $e = 15$. The owner's profit is therefore $0.95(50e - e^2)$. Thus,

If $s = 0.05$, the owner's payoff is 498.75

The manager maximizes $0.1(50e - e^2) - e$. This expression is maximized when the derivative is 0, i.e., $5 - 0.2e - 1 = 0$, which implies $e = 20$. The owner's profit is therefore $0.9(50e - e^2)$. Therefore,

If $s = 0.1$, the owner's payoff is 540

(b) The optimal e is determined by taking the derivative with respect to e of $0.05(50e - e^2 + 200\sqrt{t}) - e - t$, which yields again $e = 15$. The optimal t is determined by taking the derivative with respect to t. Therefore, $0.05(100/\sqrt{t}) = 1$, which implies $t = 25$. Therefore, the manager receives $0.05(f(30) + 200\sqrt{25}) = 76.25$. The owner's profit is $f(15) - 76.25$, i.e.,

If $s = 0.05$, the owner's payoff is 448.75

If $s = 0.1$ then the optimal e is determined by taking the derivative with respect to e of $0.1(50e - e^2 + 200\sqrt{t}) - 2e - t$, which yields again $e = 20$. The optimal t is determined by taking the derivative with respect to t. Therefore, $0.1(100/\sqrt{t}) = 1$, which implies $t = 100$. Therefore, the manager receives $0.1(f(20) + 200\sqrt{100}) = 260$. The owner's profit is $f(20) - 260$, i.e.,

If $s = 0.1$, the owner's payoff is 340

Question 4

(a) The h worker is indifferent if $\sqrt{72,900} + \sqrt{72,900} = \sqrt{m} + 0.8\sqrt{m}$. Therefore,

$\boldsymbol{m = 90,000}$

(b) Now $\sqrt{40,000} + \sqrt{40,000} = \sqrt{10,000} + 0.2\sqrt{40,000} + 0.8\sqrt{m}$. Therefore,

$\boldsymbol{m = 105,625}$

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

$$\epsilon_A = -\frac{p}{200 - p} = \frac{p}{p - 200}, \quad \epsilon_B = -\frac{10p}{300 - 10p} = \frac{p}{p - 30}.$$

Therefore,

$$20 = p_A\left(1 + \frac{p_A - 200}{p_A}\right) = p_A + p_A - 200,$$

which implies:

$$\boxed{\textbf{In country } \boldsymbol{A} \textbf{ the price is } \boldsymbol{p_A = 110}}$$

In country B,

$$20 = p_B\left(1 + \frac{p_B - 30}{p_B}\right) = p_B + p_B - 30,$$

which implies:

$$\boxed{\textbf{In country } \boldsymbol{B} \textbf{ the price is } \boldsymbol{p_B = 25}}$$

Note that $y_A = 90$ and that $y_B = 50$. Therefore, $y = 140$. Total costs are $c(140) = 2,800 + 1,400 = 4,200$. Therefore, ATC = 30. Therefore,

$$\boxed{\textbf{Profit/unit, i.e., } \boldsymbol{p} \textbf{ – ATC = –5}}$$

Question 6 Marginal costs are 150. Thus, $150 = p(1 - 1/1.2) = p/3$. Thus, $p = 900$. After the entry, $150 = p(1 - 1/2) = 3p/4$. Thus, $p = 300$.

$$\boxed{\textbf{NW lowers the price from \$900 to \$300.}}$$

Question 7 The equilibrium is U, R. Therefore,

$$\boxed{\textbf{In the Nash equilibrium } \boldsymbol{A}\textbf{'s (expected) payoff is 4}}$$

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 $0.043(30,000) = 1290$ per person. Average fixed costs are 20 Dollars. Thus,

$$\boxed{\textbf{The insurance premium is \$1,310}}$$

Suppose there are three types of people A, B, and C in a population of 1 Million. Type A people have a probability of 0.01 of becoming seriously ill. For type B the probability is 0.2, and for type C it is 0.9. The medical costs from being treated for the illness is \$30,000. The maximum willingness to pay for insurance is \$400 for type A, \$8,000 for type B, and \$27,500 for type

C. Also, assume that 90% of the population are type A, 8% are type B and 2% are type C. The type is private information, i.e., only each person knows their true probability of becoming ill, but not the insurance company. The insurance company has a fixed cost of 6 Million Dollars.

(b) In order for everyone to sign up, the insurance company can charge at most \$400. The expected costs per person are \$1,290. Thus, profit is $1,000,000(400-1,290) - 20,000,000$, i.e., -910 Million.

Alternatively, they company could charge \$8,000 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 10,200. There are 100,000 type B and C people. Thus, profit is -240 Million.

Finally, at a premium of 27,500 only type C sign up. Profit is -10 Million.

The insurance premium is 27,500

The insurance companies' total profit is -10 Million

0% of the population will be insured.