ASYMMETRIC INFORMATION:

ADVERSE SELECTION

Problem 1
A good-quality used cars gives a buyer utility of 2,400$, whereas a bad-quality one gives 1,200. A seller wants to sell the good-quality one for 2,000 and a bad-quality one for 1,000. Assume that the utility is expressed in monetary units, the same as the prices of the cars are. The potential supply of good- and bad-quality used cars is 50 each. A quality check of a car costs 80. Who covers the cost of the quality check (a buyer, a seller, or both of them partially) depends on individual negotiations.

a) Does the possibility to check the cars before their purchase allow for increasing the welfare lost due to adverse selection? Provide the reasoning for your answer.

b) What is the level of the external cost caused by the supply of bad-quality cars? Consider both cases – with the possibility of the quality check and without it.

Problem 2
Two-year old cars of a certain model are worth to their owners between 0 and 60,000 (a uniform distribution; i.e., informally, each value occurs equally often). Each car worth X for the seller has a potential buyer, for whom it would be worth 1.5X. If the cars are indistinguishable, resulting in adverse selection, what proportion of them will be sold?

Problem 3
As above but with the uniform distribution of owners' values from 20,000 to 80,000.

Problem 4
Will an insurer encounter a loss when he offers more beneficial (group) health insurance conditions to employees of some large workplace?

Problem 5
Provide at least two strategies for how an insurance company can counteract adverse selection.

Problem 6
Thousands of surfers spend their holidays every year on the Australian coast. They are exposed to the risk of getting bitten by a shark. The probability of such an event varies for different surfers and depends on the frequency of entering the water. This probability is uniformly distributed over the interval [0; 0.24] (informally: the risk levels between 0% and 24% occur equally often). An individual probability of getting bitten is known to each surfer but not to anyone else. A bitten person must bear the costs of medical treatment equal to $10,000. Because of risk aversion, each surfer is willing to pay for full insurance (that is, covering the entire treatment costs) a maximum amount of two times the individual expected value of the treatment costs (that is, 2*an individual probability of getting bitten*10,000). During the first year, the local insurer offers insurance at a price (premium) that brings zero expected profits assuming that everyone buys insurance. In each of the subsequent years, the premium is set to guarantee zero profits assuming that the average number of injuries per insuree will be the same as it was in the preceding year.

a) What is the probability of an injury within the entire population?
   What will the premium be in the first year?
   Which surfers will be willing to buy the insurance at this price?
   What will the injury probability be among those insured?
   Will the insurance company indeed achieve zero profits?

b) What will happen with the shark-bite insurance market in the second year:
   What premium will be set by the insurance company?
   Who will buy the insurance?
   How much will the insurer gain/lose?

c) What will the premium be in the long run? Who will be insured then?

d) Now, the government of the island introduces mandatory insurance against shark bites with a premium guaranteeing the insurer zero expected profits.
   What will the premium of the mandatory insurance be?

What proportion of the surfers will be unhappy about this solution?

Assuming there are 15,000 surfers, what will be the social gain/loss resulting from this solution? (Hint: Add up all the willingness-to-pay values for the insurance and subtract all premiums.)

Will the situation improve or deteriorate (in terms of social gain/loss) in comparison with the situation from point c)?

Problem 7

A series of new cars includes seemingly identical cars, but they can be divided into four categories differing in quality: A, B, C, and D. Each category consists of an equal number of cars. To determine the category of a given car, it is necessary to possess and use it for one year. There are two groups of potential buyers: 1 and 2. Group 1 is three times larger than Group 2. Nobody wants to possess more than one car. Each car is used up after 10 years, and the depreciation is linear. The price of a new car is 16. The (monetary) values of the discussed new cars to each of the two groups of buyers are given in the table below.

	Group 1	Group 2
Category A	21	18
Category B	18	17
Category C	15	16
Category D	11	12

a) Who is going to buy a new car?

b) Analyze the situation following the lapse of a year. Assume there are no other cars available, no other buyers exist, and after a year, it is only possible to sell the car in this market and buy a new car. (Hint: Knowing which consumers bought a new car in the first year, determine to whom among them it would pay off to sell the car they bought, and who may be willing to buy a one-year-old used car).

SIGNALING

Problem 8

Citizens of a given country belong to two categories which are indistinguishable for the employer: the more- and less-talented. All of them finish university studies, however not all of them with distinction. Acquiring a diploma with distinction costs $100,000 for the less-talented persons and $50,000 for the more-talented ones (involving e.g. effort, private lessons, bribes, etc.) - value calculated for the moment of obtaining the first salary. University alumni sign a contract for an indefinite period envisaging a constant annual salary and discount it based on the 10% annual discount rate. There are no possibilities of promotion. Independently of the obtained diploma and talents, each alumni may take up a job for a market salary of $40,000 per year. A certain company would like to employ only more-talented employees. What could its recruitment and wage policy look like?

Problem 9

Seemingly indistinguishable types of persons apply for a job to the mafia – tough guys and wimps. In order to select the tough guys the mafia makes each candidate undergo a painful trial. The trial lasting for m minutes decreases the tough guy's utility by m2 , while the effect on the wimp's utility is a decrease by 4m2. Being hired by the mafia increases utility by 101, independently of the type. Assuming that the capo di tutti capi accepts only full minutes of the trial (integers), how many different separating equilibria (i.e. such that one type will apply for the job and the other will not) are there? Which of these equilibria will be chosen by the capo-sadist and which by the emphatic capo?

Problem 10

In a corporation, there are More-Involved and Less-Involved employees. The utility function for the first type is $f(w,e) = w - 2e^2$, while for the second type it is $f(w,e) = w - 8e^2$, where w is the annual wage in thousand dollars and e stands for the average overtime hours per week. The company does not remunerate for overtime but registers the number of such hours. The two types of employees are indistinguishable. In the first year, each employee obtains a wage of w_0 and may take as many hours overtime per week as they wish. After the first year, some employees may be promoted. The company wants to promote only the More-Involved. A promotion results in an annual increase of the wage by $200,000. After the second year, employees may transfer to another company so the promotion does not matter anymore. Assume no discounting. Indicate all pooling and separating equilibria (i.e., what number of overtime hours in the first year may be a signal of the involvement?). Justify your answer.

Problem 11

Assume there are three types of employees: bad ones, medium ones and good ones. Each employee knows his/her type but firms seeking to employ them are not able to determine the type of an employee at the moment of signing an employment contract. Each employee has a possibility to take a free test that can specify his/her type and this employee will receive a credible certificate for the potential employers stating his/her type. Employees of which type will take the test? If the employee willing to take the test was to pay for it, how would this influence the decisions of the employees? On what factors would this decision depend?