

## Seminar 7.

**Task 1.** The cost function of the pulp mill  $TC_1 = 10 + 15Q_1 + 0,25Q_1^2$ . It sells its products at a constant price  $P_1 = 40$ . The costs of a fishing cooperative that uses the same water:  $TC_2 = 5 + 5Q_2 + 0,5Q_2^2 + Q_1^2$ . The cooperative sells its products at a constant price  $P_2 = 80$ . Both companies seek to maximize profits.

a) Determine the volume of output and profit of each enterprise, if the reservoir is a free public good.

b) The fishing cooperative has the right to charge a fixed fee from the pulp mill for each unit of its production. What fee will be set?

c) The pulp mill has the right to pollute the reservoir due to the release of its products. What fixed fee will the cooperative want to offer the factory for each unit of reduction of its output and what will be the output and profit of each enterprise?

d) The factory and the cooperative decided to unite. Determine the volume of output and profit of the combined economy.

**Task 2.** The willingness of students to pay for education in the university is expressed by the function  $P = 50 - 0,5N$ , where  $P$  - the payment;  $N$  - number of students, thousand people. The marginal social utility of higher education, expressed in money, is reflected by the function  $MU = 70 - 0,5N$ , where the  $MU$  is marginal social utility. The total costs of the university for the training of students are set by the function  $TC = 10N + N^2$ .

a) Determine the magnitude of the external effect of training a specialist with higher education.

b) Determine the tuition fee for one student and necessary subsidies for his studies, which correspond to the maximum social benefits of higher education.

**Task 3.** The poll showed that the willingness of residents of three houses to pay for landscaping their yard is expressed by the following functions:  $P_1 = 80 - Q$ ,  $P_2 = 60 - Q$ ,  $P_3 = 40 - Q$ , where  $P_i$  - the maximum amount of money that

residents agree to pay for the next tree. The total cost of landscaping is determined by the formula  $TC = 2Q + 0,5Q^2$ . Determine the Pareto-effective number of trees in the yard.

**Task 4.** In firm A, it produces products according to the production function  $x_A = \sqrt{L_A}$ , using only labour resources, while creating a negative external effect for firm B, which has a production function  $x_B = \sqrt{L_B} - 0,5x_A$ . Compare market and effective placements, if  $p_A = p_B = 8$ , wage rate  $w = 1$ .

**Task 5.** In an economy consisting of two industries, supply and demand are represented by the following functions:

$$Q_A^D = 32 - 3P_A + 2P_B; Q_A^S = -10 + 2P_A - P_B;$$

$$Q_B^D = 43 - 2P_B + P_A; Q_B^S = -5 + P_B - 0,5P_A.$$

Is a general economic equilibrium possible in this economy, is it stable?