

Демонстрационный вариант по направлению «Финансовая экономика»
Профиль «Финансовая экономика»

Sample Olympiad Examination
November 2013

First Name: _____

Last Name: _____

Examination Guidelines

- The exam consists of 5 questions. Answer all questions. Time 120 minutes.
- The exam is graded on a 100-point scale. The marks awarded for each problem are shown in parentheses.
- Write your answers to the booklet provided to you by the examiners. Use a separate page for each problem. You are not allowed to detach the sheets.
- Answer all questions in English. Any Russian text will be ignored by the grader.
- You can solve the problems in any order but you must label each problem and its sub-questions clearly and sufficiently.
- You may use the last page of your sheet as scrap paper.
- Crossed out writing will not be considered by the grader.
- You are kindly requested to use legible hand writing. The grader will ignore any illegible parts of your paper.

Examination Rules

You are required to **follow all instructions** given by the examiners. **Talking** is not allowed under any circumstances. You are not allowed to bring any **written** or **printed materials** into the examination room. **Mobile phones** and other **electronic devices** are strictly prohibited in the examination room. The proctors of the exam are not authorized to answer any **questions**. Exam participants are not allowed to **leave** the examination room until ready to turn in their work.

I have read and understood the examination rules. I will not cheat, copy or use unauthorized materials or devices.

Signed: _____

Problem 1 (20 points)

Consider the following model of a closed economy with flexible prices:

Savings function: $S = 0.2Y - 100$,

Investment function: $I = 500 - 10R$, where R is the interest rate (in percentage points),

Demand for real money balances: $(M/P)^D = 0.2Y - 20R$,

Government spending: $G = 550$,

Money supply: $M^S = 1000$,

Full-employment level of output: $\bar{Y} = 5500$.

- Find the amount of investment.
- Assume that government spending increased to $G_1 = 600$. If labor is paid according to its marginal product determine the percentage change in the nominal and the real wage.
- Assume that the central bank aims to stabilize the price level. Explain, how M^S should change in order to offset the impact on prices after the increase of government spending from 550 to 600.
- Explain how this model accommodates the increase in government spending under unchanged output. Describe the crowding out effect in this model.

Problem 2 (20 points)

Consider a simultaneous game between two risk neutral players. Player 2 can be of two types: either type A or type B and his type might affect his payoff in some cases. Player 1 believes that the probability for his rival to be type A is 0.8. Player 2 believes that the probability he is type A is 0.2. No player knows his rival's beliefs and thus, has no reason to believe that they are different than his own. Payoffs are shown in the bi-matrix depending on Player's 2 type (Type A / Type B).

P1\P2	ℓ	r
x	2, 4	1, 10/0
y	1, 2	2, 5/1

- Predict the outcome of this game. Comment on the efficiency of this outcome.
- What concept of equilibrium is used by each player to come up with his final action?

Problem 3 (20 points)

Solve the following:

- Find the extrema of the function $F(x, y) = 4x^3 + 10x^2 + 2y^2 + 2xy^2 + 9$.
- Let $F(x, y) = 9 - x^2 - y^2$, $a + bx + cy = 0$, $a, b, c \neq 0$. What are the conditions for the constraint parameters that guarantee a non-empty set of local extrema of $F(x, y)$? What are these extrema?
- Find the particular solution of the differential equation $y' = \frac{y^5 + 3x^2 \cos(y)}{x^3 \sin(y) - 3y^2 - 5y^4 x}$ given the initial condition $y(1) = 0$.

Problem 4 (20 points)

Consider the following data given on the same date of January 15, 2013 for the European style options SPXPM based on S&P500 index. All contracts expire on March 13, 2013. Make use of the first two contracts to define the discount rates and effective index price, and then check the put-call parity relation for the third contract. Were there any arbitrage opportunities on January 15? If the answer is positive, describe one arbitrage strategy.

Strike price, \$	Call price, \$	Put price, \$
$K_1=1125$	$C_1=254.6$	$P_1=4.5$
$K_2=1200$	$C_2=180$	$P_2=3.05$
$K_3=1300$	$C_3=120$	$P_3=3.9$

Problem 5 (20 points)

Firm N has two production technologies (A and B). Technology A yields 1 unit of output with 2 units of labor and 3 units of raw materials. Technology B yields 1 unit of output with 1 unit of labor and 3 units of raw materials. However, technology A does not require any additional expenses, while technology B requires to sunk 40 monetary units to launch a new production line. Each unit of labor costs 3 monetary units each unit of raw materials cost 1 monetary unit. The inverse demand function for the final good is $p = 30 - Q$.

- Assume firm N is maximizing profit and it is the only producer of the final good. Which technology should it use? What will be the price of the output, the quantity produced and the firm's profits?
- Now assume that there is a potential competitor. Firm Z considers the opportunity to enter the market. The variable cost function of the firm is $VC^Z(q) = 6q$. However, in order to enter the industry, firm Z has to incur a sunk cost of 70 monetary units. If firm Z enters the industry, the two firms will be simultaneously taking the decisions on quantities produced. Which technology would you suggest to firm N if the decision about the production technology is taken before the decision of Z to enter in or to stay out of the industry?
- Compare the prices and the social welfare in cases (a) and (b). What conclusions can you make about the role of potential competition?

Good luck!