MASARYK INSTITUTE OF ADVANCED STUDIES

SPECIMEN OF ADMISSION TEST
Master's degree programme − Academic Year 2022/2023

1) Our economy has a positive output gap. Which of these would you expect in the described economy as the developed EU economy type?

a) Inflation increases, so does the economic output; There is high unemployment rate
b) Inflation increases, so does the economic output, there is a low unemployment rate.
c) Inflation is stable, so is the economy output; there is a low unemployment rate.
d) Inflation is falling, economy output is growing, there is low unemployment rate;

2) A production manager of a very small firm is trying to achieve an optimal input structure minimizing total costs. The total physical product is 150 units per hour, the price of labor factor is $10 per hour, and the price of capital factor is $25 per hour. The marginal rate of technical substitution of factor L for factor K is equal to 1.5. The manager minimizes the total costs, when he decides …

a) To increase the amount of factor K (2 units), decrease the amount of factor L (1 unit) to decrease the total costs.
b) To increase the amount of factor L (1 unit), decrease the amount of factor K (1,5 unit) to decrease the total costs.
c) To increase the amount of factor L (2 units), decrease the amount of factor K (1 unit) to increase the total costs.
d) To increase the amount of factor K (2 units), decrease the amount of factor L (1 unit) to increase the total physical product.

3) Bicycles are manufactured using an automated production line with $200,000 annual fixed costs and $10 unit variable costs and a $65 selling price. What is the lowest price acceptable for the company in the short run?

a) $10 selling price, b) $65 selling price, c) $5 selling price, d) $0 selling price.

4) A company calculates its weighted average costs of capital. Its return on equity (ROE) is 20%, the interest rate is 4%, and the corporate income tax rate is 15%. Its total equity is 100000 $, and the total liabilities are 50000 $.

a) The weighted average capital costs (WACC) are 0,20 (20%).
b) The weighted average capital costs (WACC) is 0,15 (15%).
c) Weighted average capital costs (WACC) is 0,04 (4%)
d) Weighted average capital costs (WACC) are impossible to calculate

Solution: 1b; 2b; 3a;4b

5) Let $f(x) = a\,x$, **pro** $0 < x < 10$, **where a is an unknown constant. What should be the magnitude of this constant a so that $f(x)$ is the probability density of the random variable X?**

a) $a = 5$

b) $a = \frac{1}{5}$

c) $a = \frac{1}{10}$

d) $a = \frac{1}{50}$

Solution:

In general, the following applies to the probability density:

$$\int_{-\infty}^{+\infty} f(x)dx = 1$$

Then the constant a, we determine from the following equation:

$\int_{0}^{10} ax\,dx = 1$, so: $50 \cdot a = 1$, $a = \frac{1}{50}$

6) The random variable X, expressing the change in work performance when the remuneration system is changed, has the probability density:

$$f(x) = \frac{3}{8}x^2; \quad 0 < x < 4$$
$$= 0 \quad ; \qquad \text{for other values of } x$$

The mean $E(X)$ of this random variable is:

a) E(X) = 3

b) E(X) = 6

c) E(X) = 24

d) E(X) = 36

Solution:

$$E(X) = \int_{0}^{4} x\,\frac{3}{8}x^2 dx = \frac{3}{8}\left[\frac{x^4}{4}\right]_{0}^{4} = \mathbf{24}$$

7) The manager records in the table the completion of the task in various combined deployments of four workers marked **P1, P2, P3,** and **P4**. If the i-order worker has a value of $P_i = 0$, the given worker is not assigned to the monitored task; if $P_i = 1$, the given worker is assigned to the monitored task. The variable **R** indicates the completion of the task at a value of **R = 1** and the failure of the task at **R = 0** (see table).

P_1	P_2	P_3	P_4	R
0	0	0	0	0
0	0	0	1	1
0	0	1	0	0
0	1	0	0	1
1	0	0	0	0
0	0	1	1	1
0	1	1	0	1
1	1	0	0	1
1	0	1	0	0
0	1	0	1	1
1	0	0	1	1
0	1	1	1	1
1	1	1	0	1
1	0	1	1	1
1	1	0	1	1
1	1	1	1	1

The manager suspects that among the four monitored workers, some are redundant (without affecting the performance of task **R**).

These redundant workers are:

a) P_1 and P_3

b) P_1 and P_4

c) P_2 and P_4

d) no worker is redundant

Solution:

From the table or the minimized combination equation: $R = P_2 + P_4$, it follows that the redundant workers are P_1 and P_3.

8) The company, based on past data, compiled a regression model of demand d (thousand CZK/year) for its dominant product, which is expressed by the following equation:

$$d = f(x_1, x_2) = 10 + 0{,}1x_1 - 0{,}5x_2;$$

where x_1 is the annual investment (million CZK/year), and x_2 is the average price of the dominant product (thousand CZK/pc).

The company can regulate factors x_1 and x_2 within the following limits: $x_1 \in \langle 1; 5 \rangle$ million $\frac{\text{CZK}}{\text{year}}$, $x_2 \in \langle 0.1; 0.5 \rangle$ thousand $\frac{\text{CZK}}{\text{pc}}$

The maximum annual demand for the dominant product $d = f(x_1, x_2)$ is equal to:

a) 10.05 thousand pc/year
b) 10.25 thousand pc/year
c) 10.45 thousand pc/year
d) 10.75 thousand pc/year

Solution:

The best setting (for maximum demand) is x₁ at the maximum, i.e. x₁=5 million $\text{million}\frac{\text{CZK}}{\text{year}}$ and x₂ at the minimum (price-elastic demand), i.e. x₂=0.1 thousand $\frac{\text{CZK}}{\text{pc}}$. Then $d = f(x_1, x_2)$ is:

$$\boldsymbol{d = f(x_1, x_2) = 10 + 0.1 \times 5 - 0.5 \times 0{,}1 = 10.45} \text{ thousand pc/year}$$