Микроэкономика 1 — МИЭФ, 2026 demo midterm

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PROBLEM 1

Short questions — 50 points

Each question is worth **10 points**.

(a) (10 points) "In-kind transfer of good X can never be better for an individual than a monetary transfer of the same value, but it can be worse."

True or false? Explain.

(b) (10 points) Suppose Susan has income M, and her demand function for good X is

$$x = \frac{\sqrt{p_x M}}{p_x + p_y}.$$

Is good X an ordinary good for Susan? Is good X a necessity?

(c) (10 points) "If Q^* is the output level for which

$$STC(Q^*) = LTC(Q^*),$$

then

$$SMC(Q^*) = LMC(Q^*).$$

True or false? Explain.

(d) (10 points) Consider a constant-cost perfectly competitive industry with market demand

$$Q^D(p) = 200 - 10p.$$

All firms in the industry have identical technologies, and an individual firm's long-run supply curve is

$$q^s(p) = \begin{cases} 2p, & p \geq 5, \\ 0, & p < 5. \end{cases}$$

Find the number of firms in the long-run equilibrium.

(e) (10 points) Bob's demand for good X is

$$q(p) = 10 - p.$$

Bob can either:

- purchase any quantity of good X at the market price $p = 5$; or
- accept a special offer consisting of a bundle of 4 units sold at a per-unit price of 4.

A consumer who accepts the special offer cannot supplement the bundle with purchases at the market price and cannot resell any units.

Should Bob accept the special offer or buy at the regular market price?

PROBLEM 2

Water tariff and fixed charge — 25 points

Consider an economy with two goods:

- water services, X;
- an aggregate commodity, Y.

The price of X is 16, and the price of Y is 2.

Abby has utility function

$$u(x, y) = x^2 y.$$

She is initially at her consumption optimum and consumes 2 units of good X and some quantity of good Y.

(a) (5 points) Find:

- the quantity of good Y consumed — **4 points**;
- Abby's income — **1 point**.

(b) Suppose the water company reduces the per-unit price of water to p and simultaneously introduces a fixed charge

$$F = 36,$$

which must be paid to obtain access to water consumption.

After these changes, Abby is exactly as well off as before.

(i) (8 points) Find:

- the resulting change in Abby's water consumption;
- the resulting change in the water company's total revenue.

The derivation of the new consumption of x, total revenue, and the comparison with the initial situation is worth **8 points**.

(ii) (4 points) Explain the results obtained in part (i):

- explanation of the change in water consumption — **2 points**;
- explanation of the change in water-company revenue — **2 points**.

(iii) (8 points) Provide a well-labelled graphical solution with comments.

PROBLEM 3

Competitive equilibrium and a production subsidy — 35 points

Consider an economy with 60 identical consumers. Each consumer has income

$$M = 400$$

and utility function

$$u(x, y) = y - (10 - x)^2.$$

The price of good x is p, and the price of good y is 1.

(a) (5 points) Derive the individual demand function for good x and explain the shape of the demand curve. Consider interior solutions only.

Point allocation:

- derivation of demand — **3 points**;
- explanation of the shape — **2 points**.

(b) (9 points) Suppose good x is produced by profit-maximizing price-taking firms with identical technology

$$F(K, L) = 4(KL)^{0.25}.$$

The wage rate is 16, and the rental rate of capital is 1. Assume that all factors are variable.

Derive the individual firm's supply curve.

(c) (5 points) Suppose there are 90 firms in the industry, and new firms cannot enter during the current period.

Find the resulting equilibrium, assuming all inputs are variable.

Point allocation:

- market demand — **2 points**;
- market supply — **1 point**;
- equilibrium — **2 points**.

(d) The government subsidizes production of good x, but only 60 of the 90 firms receive the subsidy. The subsidized firms are chosen randomly, and the outcome is announced before production decisions are made.

The subsidy equals 50% of the price paid by consumers and is financed by a lump-sum tax that is the same for all consumers. Entry remains impossible.

(i) (8 points) Find the resulting equilibrium and illustrate it graphically in price-quantity axes.

The price on the vertical axis must be the price paid by consumers.

Point allocation:

- derivation of the new market supply — **2 points**;
- equilibrium — **1 point**;
- well-labelled graph — **5 points**.

(ii) (8 points) Calculate the resulting gain or loss in total surplus and discuss the sources of the efficiency gain or loss.

Point allocation:

- calculation of deadweight loss — **5 points**;
- discussion of the sources of efficiency loss — **3 points**.

PROBLEM 4

Cost minimization and firm supply — 50 points

(a) Firm N

Suppose firm N currently operates at point A, where 10 units of output are produced using 8 units of labour and 6 units of capital.

The per-unit price of labour is 1, and the current cost of production is 20.

(i) (6 points) Define an isocost line verbally and write the equation of the isocost line passing through point A.

Point allocation:

- definition of an isocost line — **2 points**;
- calculation of the rental rate of capital, r — **2 points**;
- equation of the isocost line — **2 points**.

(ii) At point A, the marginal product of labour is 3 and the marginal product of capital is 4.

Assuming the technology has diminishing marginal rate of technical substitution, illustrate the isoquant and isocost passing through point A.

Assuming all factors are variable, explain why the current factor combination is not cost-minimizing for the given output level. Explain how total cost could be reduced.

(iii) For the case in part (ii), illustrate the cost-minimizing factor combination and denote it by B.

Show on the graph the minimum cost of producing 10 units of output and denote it by C_{10}.

Now suppose that in the short run capital is fixed at

$$K = 6.$$

Illustrate the change in production cost relative to the long-run minimum and denote it by ΔC.

Explain carefully.

(b) Firm M

Suppose firm M has production function

$$F(K, L) = \sqrt{K} + \sqrt{L}.$$

(i) (8 points) Suppose the wage rate is 1 and the rental rate of capital is r.

Derive the long-run cost function.

(ii) (5 points) Let the per-unit output price be p.

Derive the firm's supply curve.

(iii) Suppose

$$p = 4,$$

and the rental rate of capital rises from 1 to 2.

Find the resulting changes in:

- quantity supplied;
- quantity of capital demanded by firm M.

(iv) Decompose the change in capital demand into:

- a substitution effect;
- an output effect.

Define each effect and illustrate the decomposition graphically. Do not reuse the graph drawn for part (a).