

ENTRANCE EXAM – EXAMPLE

A – ECONOMICS (30 points – 1 hour 15 minutes)

Part I – Macroeconomics

1. What is the maximum potential change in GDP if the government increases its spending by \$ 2 mil and the marginal propensity to save is 0.25? Explain.

2. *Complete the following sentences using the words in brackets:*

Monetary policy is the process by which the monetary authority of a country attempts to influence the economy through changes in _____ (A: government spending and taxation; B: the supply of money and interest rates; C: interest rates and taxation; D: government spending and the supply of money.) One of the tools of monetary policy is _____ (A: changes in tax rates; B: the reserve ratio; C: changes in private credit market rates). Contractionary monetary policy involves an open market _____ (A: sale; B: purchase) of various credit instruments, foreign currencies of commodities. The goal is to _____ (A: lower; B: raise) domestic interest rates to _____ (A: stimulate; B: slow down) the economy.

3. (*) Consider a hypothetical economy with aggregate consumption $C=300+0.3Y$, aggregate investment $I=200+0.2Y$, government spending $G=400$ and Net Exports $NX=600$, where Y is the aggregate income. What is the level of aggregate investment in this economy? Explain.

4. Explain why you agree or disagree with the following statement: “*Ceteris paribus*, a country’s currency will appreciate if its inflation rate is less than that of the rest of the world.”
5. (*) Suppose that in a hypothetical economy the consumption basket is currently worth \$100. The inflation rate is known to be 200% per year. A saver puts \$10 000 on a bank account at the nominal interest rate of 150% per year.
- a) What is the purchasing power of this deposit at the end of the year?
- b) What is the real return on this deposit in one year?

Part II – Microeconomics

1. There are two industrial firms in a region that pollute the air.

Firm	Initial pollution level	Cost of reducing pollution by 1 unit
A	70 units	\$ 20
B	50 units	\$ 10

The government wants to reduce pollution to 70 units, so it gives each firm 35 pollution permits.

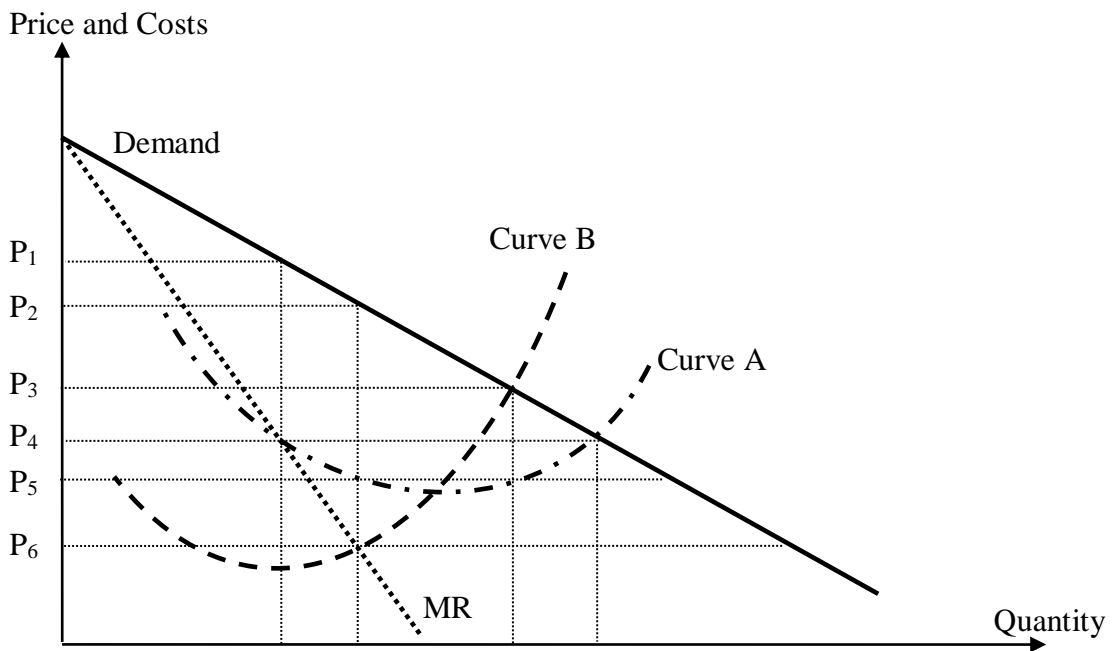
- a) What would be the cost of pollution reduction be if the permits cannot be traded?
- b) (*) Suppose now that the firms are allowed to trade pollution permits. Given the difference in the cost of pollution reduction, which firm will sell permits and what maximum price can it charge?
- c) (*) If the firms are allowed to trade pollution permits, what is the total cost of pollution reduction?

2. *Complete the following sentences using the words in brackets:*

Subject to certain qualifications, a _____ (A: competitive market; B: monopolistic market) economy leads to an efficient use of society's scarce resources. When a good is produced in the least costly way then _____ (A: allocative; B: productive) efficiency is achieved, meaning that the market price of a product is equal to its _____ (A: minimum average total cost; B: marginal cost) of production. When firms use resources to produce the mix of goods and services that consumers want the most, then _____ (A: allocative; B: productive) efficiency is achieved, implying that the market price of a product is equal to its _____ (A: minimum average total cost; B: marginal cost) of production.

3. Using the supply-demand diagram, explain how a minimum wage regulation can hurt low-skilled workers.

5. Consider the case of a pure monopoly depicted on the graph below:



- Curve A is the _____ (Average Total Cost; Marginal Cost) curve.
- Curve B is the _____ (Average Total Cost; Marginal Cost) curve.
- The monopoly price is given by _____ ($P_1, P_2, P_3, P_4, P_5, P_6$)
- (*) Clearly mark the area corresponding to the monopoly's profit.
- (*) Clearly mark the area corresponding to the monopoly's deadweight loss.

B – MATHEMATICS (30 points – 1 hour 15 minutes)

- 1) Random variable ξ has the following probability density function: $P(x) = \begin{cases} 2b, & 0 \leq x < 1, \\ b, & 1 \leq x \leq 2, \\ 0, & x \notin [0, 2]. \end{cases}$

Calculate:

- a) coefficient b , and distribution function $F_{\xi}(x)$;
- b) mathematical expectation M_{ξ} ,
- c) variance D_{ξ} ;
- d) probability that random variable ξ will become greater than $\frac{5}{6}$.

2) Calculate $\int x \cdot e^{\frac{-x^2}{2}} \cdot dx$

- 3) Find the solution of the given matrix equation:

$$\begin{pmatrix} 1 & -1 \\ 3 & 4 \end{pmatrix} \cdot X = \begin{pmatrix} 3 & 5 \\ 2 & 4 \end{pmatrix}.$$

- 7) For each of the following points $x = 2; y = 1$ and $x = -1; y = -2$ determine whether it is local max point, local min point or neither for the given function:

$$z = x^3 + 3xy^2 - 15x - 12y. \quad (4 \text{ points})$$

- 8) Mega Memory Devices, a firm that assembles memory boards for personal computers, buys 60% of its memory chips from supplier A and the remainder from supplier B. Supplier A produces memory chips that are 5% defective, and B produces 10% defective. A memory chip is selected at random from the inventory. A test of the chip shows that it is defective. What is the probability that the chip was supplied by A? (2 points)

11) Find the general solution of the following differential equations:

a) $y'' - y' - 2y = 0$

b) $y'' - y' - 2y = e^x$

c) $y'' - y' - 2y = 4e^{-x}$

C – English (10 points – 30 minutes)

Reading Comprehension. (2,5 points)

In this section of the test you will read two passages. Each passage is followed by a number of questions about it. Answer all questions about the information in a passage on the basis of what is stated or implied in that passage and choose one best answer (A), (B), (C) or (D).

Passage 1

The technology of the North American colonies did not suffer strikingly from that of Europe, but in one respect, the colonists enjoyed a great advantage. Especially by comparison with Britain, Americans had a wonderfully plentiful supply of wood.

The first colonists did not, as many people imagine, find an entire continent covered by a climax forest. Even along the Atlantic seaboard, the forest was broken at many points. Nevertheless, all sorts of fine trees abounded, and through the early colonial period, those who pushed westward encountered new forests. By the end of the colonial era, the price of wood had risen slightly in eastern cities, but wood was still extremely abundant.

The availability of wood brought advantages that have seldom been appreciated. Wood was a foundation of the economy. Houses and all manner of buildings were made of wood to a degree unknown in Britain. Secondly, wood was used as fuel for heating and cooking. Thirdly, it was used as the source of important industrial compounds, such as potash, an industrial alkali; charcoal, a component of gunpowder; and tannic acid, used for tanning leather.

The supply of wood conferred advantages but had some negative aspects as well. Iron at that time was produced by heating iron ore with charcoal. Because Britain was so stripped of trees, she was unable to exploit her rich iron mines. But the American colonies had both iron ore and wood; iron production was encouraged and became successful. However, when Britain developed coke smelting, the Colonies did not follow suit because they had plenty of wood and besides, charcoal iron was stronger than coke iron. Coke smelting led to technologic innovations and was linked to the emergence of the Industrial Revolution. In the early nineteenth century, the former colonies lagged behind Britain in industrial development because their supply of wood led them to cling to charcoal iron.

1. What does the passage mainly discuss?
 - (A) The advantages of using wood in the colonies
 - (B) The effects of the abundance of wood in the colonies
 - (C) The roots of the Industrial Revolution
 - (D) The difference between charcoal iron and coke iron

2. The word “strikingly” in the first paragraph is closest in meaning to
 - (A) realistically
 - (B) dramatically
 - (C) completely
 - (D) immediately

3. According to the passage, by the end of the colonial period, the price of wood in eastern cities
 - (A) rose quickly because wood was becoming so scarce.
 - (B) was much higher than it was in Britain.
 - (C) was slightly higher than in previous years.
 - (D) decreased rapidly because of lower demand for wood.

4. What can be inferred about houses in Britain during the period written about in the passage?
 - (A) They were more expensive than American houses.
 - (B) They were generally built with imported materials.
 - (C) They were typically smaller than homes in North America.
 - (D) They were usually built from materials other than wood.

5. According to the passage, why was the use of coke smelting advantageous?
 - (A) It led to advances in technology.
 - (B) It was less expensive than wood smelting.
 - (C) It produced a stronger type of iron than wood smelting
 - (D) It stimulated the demand for wood.

Task 2. Fill the gaps in the following text with only one word in each space. (7,5 points)

The first known taxi was an Egyptian water cab in about 4000 BC. In the 17th century, first in Paris, then in London, there were horse-drawn hackneys and as (1) as 1623 London's wherry-boat operators were already complaining that the hackneys (2) them of their living.

Taxis soon came (3) government regulation. In 1800, in Paris, the cabriolet, a speedy two-wheeled carriage (4) by a single horse, was dubbed the 'cab'

(5) in 1834, Joseph Hansom patented the Hansom Cab. Before the automobile became the taxi (6) choice, there were a few eccentric efforts to improve

(7) the Hansom Cab, but (8) was Harry N. Allen who was the father of the taxi cab. (9) his New York vehicles he imported the French *taxi-mètre*, which (10) measure taxes, (11) 'fares', and the 'taxi cab' was born.

(12) as the men who made Hollywood were dreamers and entrepreneurs, so (13) the men who made the taxis in America run. (14) them was John Hertz, who got (15) the taxi business in 1907.