UNIVERSITY OF LONDON

EC1002

Introduction to Economics

Candidate should answer all **EIGHT** questions in Section A and **BOTH** questions in Section B.

Please find questions on the following page.

Section A

Please indicate if the statement is true/false/uncertain and provide an explanation.

1. Isoquants curves can be linear.
2. Min and Anushka are planning their summer holiday. Their two options are a mountain retreat and a beach vacation. Given their payoffs in the matrix below there are two Nash equilibria in pure strategies for this game.

Min/Anushka	Mountain retreat	Beach vacation
Mountain retreat	6,1	0,0
Beach vacation	0,0	2,3

3. In the presence of externalities, a competitive market will always lead to overproduction of the good.
4. In a general equilibrium with two goods, agents with identical preferences consume the same amount of the goods.
5. Consider a small closed economy. We have $C = a + cY, G = G_0 - gY$ (this means government expenditure is counter cyclical. When the economy is booming it falls and when we have a recession it rises), and $I = I_0 - br$ where G_0 is autonomous government expenditure, I_0 is autonomous part of investment, $a, b,$ and g are positive parameters, and $0 < c < 1$. The multiplier is smaller than $1/(1 - c)$.
6. The real exchange rate is the nominal exchange rate adjusted for inflation.
7. Assume a country experiences a positive aggregate supply shock due to improvement in technology. In this case the economy's output will rise and inflation will fall so there is no need for contractionary monetary policy.
8. Unemployment in full employment equilibrium falls if matching improves between the skills that employers demand and the skills that the work force is endowed with, ceteris paribus.

Section B

Q9

In this question we will model the recent rise in AI, from the Turing machine to recent developments.

a) In 1936 Alan Turing invented a prototype of a computer, the Turing Machine, that marked the beginning of investments in artificial intelligence (AI). At the time, Alan Turing was the sole monopolist for the machine. Suppose that the inverse demand for Turing Machines was $P = 44 - 2Q$ and Alan had a cost function $C(Q) = 8Q$. What would be the monopoly outcome in this market? Find the industry quantity, price and profits. [7 marks]

b) Companies started investing in different strands of AI. Let's consider Alphabet and OpenAI, competing to offer AIs that help consumers retrieve information and automate repetitive tasks. They compete in quantity with the same demand function and cost functions as in part a), that is each firm has a cost function $C(q_i) = 8q_i$, where q_i is the firm's production. Find the Cournot-Nash equilibrium in this market. Are total profits higher than under a monopoly? [Hint: remember that Q here is the aggregate output]. [10 marks]

c) As more companies enter the AI market, the market becomes perfectly competitive. Assuming no changes in the demand and cost structure, what would be the market outcome? Show the market outcome in a diagram. [6 marks]

d) In the future governments might be considering implementing a licensing system for AI producers, aiming to prevent the mistreatment of AI and the dissemination of false information. We can model the license fee as a fixed cost that firms would need to incur before trading their product. Discuss potential changes in market quantity, price, and consumer welfare. [7 marks]

Q10

a) Consider the Solow growth model where $Y = F(K, L)$. Y is output, K is capital stock and L is the work force. Derive the steady state equilibrium condition of this model if depreciation rate is zero, s is the savings rate, and n is the labour force growth rate, and draw the diagram showing the equilibrium. [10 marks]

b) Singapore in the 1980s experienced a large inflow of labour. Assume this is one off increase in L (A one period increase in stock of labour). Analyse the impact of this change in the short run and the long run on output per worker, growth of output per worker and capital labour ratio and illustrate the impact on steady state equilibrium in a diagram. [10 marks]

c) Assume $F(K) = K^{1/3} L^{2/3}$, s is 12% and n is 3%. Specify the production function and find how much capital per worker will change over time starting from $k = 4$. What is the steady state value of k? [10 marks]

End of paper