

QUEEN'S UNIVERSITY FINAL EXAMINATION
FACULTY OF ARTS AND SCIENCE
DEPARTMENT OF ECONOMICS

ECON 222 001-002 – Professors Bill Dorval & Mike Kennedy
April 20, 2024

INSTRUCTIONS TO STUDENTS:

This examination is 3 HOURS in length.

There are 2 sections to this examination. Section A consists of multiple-choice questions. You should answer all 20 of them. Each question is worth 1 mark for a total of 20 marks. Section B consists of 4 long questions. Each question is worth 20 marks for a total of 80 marks. Marks will be awarded on the basis of the logical arguments given to support your answers.

Please record multiple choice answers on the provided scantron, and long answers in the distributed answer booklets.

The following aids are allowed:
Casio FX-991 calculator

Put your student number on all pages of all answer booklets, including the front.
GOOD LUCK!

PLEASE NOTE:

Proctors are unable to respond to queries about the interpretation of exam questions.
Do your best to answer exam questions as written.

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Multiple-Choice Instructions. Multiple-choice answers on the answer sheet are marked by an optical scanner. It reads only what is in the rectangle. Fill it in completely and stay within its limits. You must use a soft lead (e.g. "HB") pencil to fill in the Answer Sheet. Remember, if you need to change your answer, COMPLETELY ERASE IT, and correct it. For all questions, there is only one best (correct) answer; if two or more choices are marked, the item will be graded incorrect.

Before You Begin the Exam:

1. Write your Student # under “**I.D. Number**” on the Answer Sheet and fill in the appropriate rectangle below each number. **See example below.**
 2. Print your **Last Name** followed by first name in the appropriate space, and fill in the appropriate rectangle under each letter. (If your name is too long to fit in the spaces provided, please enter as many letters as you can.) **See example below.**
 3. Under “**Test Form**”, fill in “**A**”. **See example below.**

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Part A (MULTIPLE CHOICE): Answer ALL the following questions. Choose the one alternative that best completes the statement or answers the question.

- 1) The A company collects bushels of wild berries, which it sells for \$2 million to the B company to be made into jam. The B company's wild berry jam is sold for a total of \$6 million. What is the total contribution to the country's GDP from companies A and B?
A) \$2 million
B) \$4 million
C) \$6 million
D) \$8 million

- 2) The principle of diminishing marginal productivity implies that
A) if we increase labour and capital, the output will eventually decrease.
B) if we decrease labour and capital, the output will decrease.
C) if we increase one input while keeping other inputs constant, the productivity of variable input will decrease.
D) if we increase one input while keeping other inputs constant, the output will decrease.

- 3) An adverse supply shock would
A) shift the production function up and decrease marginal products at every level of employment.
B) shift the production function down and decrease marginal products at every level of employment.
C) shift the production function down and increase marginal products at every level of employment.
D) shift the production function up and increase marginal products at every level of employment.

- 4) Your boss wants to know if you should lay off any workers. You answer that you should lay off workers if the
A) marginal revenue product of labour is greater than the nominal wage rate.
B) marginal product of labour is greater than or equal to the real wage rate.
C) marginal revenue product of labour is equal to the nominal wage rate.
D) marginal product of labour is less than the real wage rate.

- 5) The tendency to reduce current consumption and increase future consumption as the real interest rate increases is called
- A) the substitution effect of the real interest rate on saving.
 - B) the income effect of the real interest rate on saving.
 - C) the net effect of the real interest rate on saving.
 - D) the substitution effect of the real interest rate on investment.
- 6) An economy in which output exceeds absorption
- A) will send goods abroad and have a current account surplus.
 - B) is a net importer with a current account deficit.
 - C) is a net borrower in the international market.
 - D) will have a capital account deficit.
- 7) The Ricardian equivalence proposition says that
- A) a budget deficit caused entirely by a current tax cut has no effect on the economy.
 - B) a budget deficit resulting solely from higher government purchases has no impact on the economy.
 - C) any budget deficit generated by the government has no effect on the economy.
 - D) an increase in government spending accompanied by an equivalent increase in taxes has no effect on the economy.
- 8) The main difference between the small open economy and the large open economy is that
- A) the former faces a fixed international real interest rate, but the latter can influence it.
 - B) the former can influence the international real interest rate, but the latter cannot.
 - C) the former cannot maintain a large current account deficit, but the latter can.
 - D) the former can maintain a large current account deficit, but the latter cannot.
- 9) Which of the following is *true* when the expected future marginal product of capital increases?
- A) The investment and the current account rise.
 - B) The investment rises, but the current account declines.
 - C) The investment and the current account declines.
 - D) The investment declines, but the current account rises.

10) Over the past year, output grew 6%, capital grew 2%, and labour grew 4%. If the elasticities of output with respect to capital and labour are 0.3 and 0.7, respectively, how much did productivity grow?

- A) 2.0%
- B) 2.6%
- C) 3.0%
- D) 3.3%

11) In the neoclassical growth model, if productivity does NOT grow,

- A) output per worker will be constant.
- B) output will grow at the same rate as the population growth.
- C) consumption will be constant.
- D) both A and B are correct.

12) According to the endogenous growth theory,

- A) the primary source of growth is population growth.
- B) the primary source of growth is capital growth.
- C) the marginal productivity of capital does not need to decrease as capital stock increases.
- D) the marginal productivity of capital decreases as capital stock increases.

13) If the interest elasticity of money demand is $-1/4$, by what percent does money demand rise if the nominal interest rate rises from 4% to 5%?

- A) 6.25%
- B) 0.25%
- C) -0.25%
- D) -6.25%

14) For any real interest rate, an increase in the expected inflation

- A) increases the nominal interest rate and reduces the demand for money.
- B) increases the nominal interest rate and increases the demand for money.
- C) decreases the nominal interest rate and reduces the demand for money.
- D) decreases the nominal interest rate and increases the demand for money.

15) The *FE* line is vertical because the level of output at full employment does not depend on the

- A) real wage rate.
- B) level of employment.
- C) marginal product of labour.
- D) real interest rate.

16) A tax cut on capital will

- A) shift the *IS* curve down and to the left.
- B) shift the *LM* curve up and to the right.
- C) shift the *IS* curve up and to the right.
- D) shift the *LM* curve down and to the left.

17) A rise in the price of a bond causes the yield of the bond to

- A) rise.
- B) fall.
- C) remain unchanged.
- D) rise if it is a short-term bond and fall if it is a long-term bond.

18) The real exchange rate is

- A) the price of one currency in terms of another.
- B) the price of domestic goods relative to foreign goods.
- C) the quantity of gold that can be purchased by one unit of currency.
- D) the difference in interest rates between the two countries.

19) Under flexible exchange rates, an increase in the nominal money supply will:

- A) stimulate net exports in the short run.
- B) cause the nominal exchange rate to decline in the short run.
- C) will have no effect on the real exchange rate in the long run.
- D) all of the above.

20) Which of the following statements describes the interest parity condition?

- A) In the equilibrium, all the prices must be the same in the international market.
- B) In the equilibrium, the inflation rates must be the same in the international market.
- C) In the long run, the exchange rates must be the same in the international market.
- D) In the equilibrium, the rates of return on assets of comparable risk and liquidity must be the same in the international market

Part B (Long Questions):

B1. The Neoclassical growth model (20 marks)

Consider an economy with the following aggregate production function:

$$Y_t = AK_t^\alpha L^\beta N_t^{1-\alpha-\beta} \quad \text{Production function}$$

where Y_t is aggregate output, A represents total factor productivity, K_t is the aggregate capital stock, N_t is the number of workers in the economy, and L is the quantity of available land. Total factor productivity, A , and land, L , are fixed (constant). The labour force grows at rate n , capital depreciates at rate d , and the households save a constant fraction s of their income.

- a) Let $y_t = \frac{Y_t}{N_t}$, $k_t = \frac{K_t}{N_t}$, and $l_t = \frac{L}{N_t}$. Derive the intensive form of the production function in per worker terms. Show your steps.
- b) The steady state level of investment for this economy is: $I = (n + d)K$. Find an expression for the capital-labour ratio in the steady state, k^{ss} .
- c) Derive an algebraic expression for the Golden Rule level of capital per worker, k_G . Show graphically this special steady state.
- d) Now assume there is an environmental disaster and 10% of the land becomes unusable for production. Find an equation for the new steady-state capital-labour ratio. Show on a graph and explain the transition between the old and the new equilibrium.

B.2 Asset Market (20 marks)

Assume the real money demand function is:

$$L(Y, i) = 1000 + 0.5Y - 5000(r + \pi^e) \quad \text{Real money demand}$$

where Y is real output, P is the price level, r is the real interest rate on non-monetary assets, π^e is expected inflation.

- a) Assuming that the asset market is in equilibrium at $i = 0.05$. Find equilibrium levels of the real money supply, the nominal money supply, and the velocity of money if $P = 1$, and $Y = 500$. (Note: please round your answers to the nearest three decimal places for all parts of this question.)
- b) Find the real income elasticity of money demand at the equilibrium level of money balances found in part a). Explain what it means.

- c) The rate of inflation in this economy is defined as the growth rate of the nominal money supply minus an adjustment for the growth rate of real money demand arising from growth in the real output:

$$\pi = \frac{\Delta M}{M} - \eta_y \frac{\Delta Y}{Y} \quad \text{Inflation}$$

Suppose the central bank has a target inflation rate of 2%, real output growth is 8%, and the income elasticity of real money demand equals the value found in part b). What actions could the central bank take to attain this objective?

- d) Does the quantity theory of money hold in this economy; that is does $MV = PY$? State your reason by considering the new levels of nominal money supply, real output, and price using the growth rates from part c).

B.3 Closed economy IS-LM-FE model (20 marks)

The following represents the key equations of a closed economy

$$C^d = 14 + 0.75(Y - T) - 80r \quad \text{Desired consumption}$$

$$I^d = 18 - 60r \quad \text{Desired investment}$$

$$Y = C^d + I^d + G \quad \text{Equilibrium in the goods market}$$

$$M/P = 7 + 0.5(Y - T) - 140(r) \quad \text{Real money supply is equal to demand}$$

In the above, Y is real output, T is total taxes, G is government spending, r is the real interest rate and P is the price level. Note that $\pi^e = 0$, so that the nominal rate of interest is equal to the real rate and that the central bank controls the nominal money supply (M). As well, note that the sum of the interest rate coefficients on desired consumption and investment is equal to that of money demand, a feature that will simplify your calculations of the aggregate demand curve.

- a) Derive both the *IS* and *LM* curves for this economy, with r on the left-hand side as well as the *AD* curve, also with Y on the left-hand side. Note that, different for the classroom version, the demand for money is related to *after-tax* income. Looking at the *IS* and *LM* curves, discuss (no calculations required) what would happen to each curve if the level of taxation were to fall? Briefly explain why.
- b) You are given the following information: the nominal money supply is 40; the price level is 1; the level of taxation is 20; and the government has a budgetary surplus of 5. Based on this, find the level of full-employment output (Y) and then the real rate of interest (r).

- c) With an election pending, the government is coming under pressure to do something about its surplus. One group wants the level of taxation to be reduced to the level of government spending, while the other wants government spending to be raised to match current levels of taxation. Based on your aggregate demand curve, calculate the short-run effect of each policy on GDP and the real rate of interest. What happens to interest rates in each case and why? You are to assume that the nominal money supply stays constant at 40.
- d) As prime minister, you have to make a decision. Using your answers from part c, suppose that a significant proportion of the population is young and they are worried about overall demand conditions, in other words, employment prospects. On the other hand, there is an older group that wants less government spending, with minimal effects on interest rates. Both groups are happy to have a balanced budget in place. Based on your model, which alternative appeals to each group.

B.4 The open economy *IS-LM-FE* model (20 marks)

The following represents the key equations of an open economy:

$C^d = 2 + 0.80Y - 80r^w$	Desired consumption
$I^d = 13 - 60r^w$	Desired investment
$NX^d = 12 - 0.1Y - 2e$	Desired net exports
$Y = C^d + I^d + G + NX^d$	Equilibrium in the goods market
$M/P = 12 + 0.5Y - 140r^w$	Real money supply is equal to demand
$e = e_{nom}P/P_{For}$	Real exchange rate

As in **Question B.3**, you will notice that the sum of the interest rate coefficients on desired consumption and investment is equal to that on money demand, a feature that will simplify your calculations. For simplicity, taxation is zero – one less thing to worry about.

- a) Use the above model to find equations for the *IS* and *LM* curves, with r^w on the left-hand side in each case. Now use these two relationships to derive the aggregate demand curve, first with Y on the left-hand side and then with P on the left-hand side.
- b) You are given the following values for key variables: government spending (G) is 10; the real money supply (M/P) is 50; and the real exchange rate (e) is 1.5. Find the level of output, the world real rate of interest (r^w) and the trade balance (NX). Assuming that the level of output you found is the economy's equilibrium level and given that $M = 50$, find the equilibrium price level. Finally suppose that the price level in the foreign country (P_{For}) is 0.6; what is the level of the nominal exchange rate (e_{nom})?

- c) Assume that the exchange rate is *flexible* and that the central bank, worried about the high level of prices compared with the foreign country, decides to lower the level of the money supply (M) from 50 to 48. Find the short-run effect on the level of output (Y), the real and nominal exchange rate (e and e_{nom}) and net exports (NX) and then the long-run effect of this policy on these variables.

[Hint: To find the short-run effect on output, use the LM curve and then proceed to the IS curve to find the short-run level of the real exchange rate, e . To find the long-run effect on the domestic price level use the definition of the real exchange rate.]

- d) Suppose that the government decides to *fix the exchange rate* at the nominal value that you found in part b). Note that this assumption implies that the *initial* real exchange rate is as above, 1.5. The government still wishes to have a lower price level for competitive reasons but, with fixed exchange rates, they cannot use monetary policy. Based on advice from this class, they decide instead to cut government spending from 10 to 9. Use the IS curve that you found in part b) to find the short-run level of output, remembering that e is unchanged. From class, you know that the economy will return to its long-run equilibrium level of output but with a lower level of G and with implications for net exports. Use the net export equation to find the new level of the real exchange rate. Note you will need to find the new level of the trade balance. Finally, based on the definition of the real exchange rate, find the new price level.

Comparing the two systems (fixed and flexible exchange rates), which saw the largest fall in the price level?