

MACROECONOMICS 2026
SHANGHAI JIAO TONG UNIVERSITY
SUMMER SCHOOL 2026
QUIZ 2

Reading time: 10 minutes. **Writing time:** 60 minutes.

Total marks: 100. **Calculators are permitted.**

Instructions: Answer **all** questions. In Section A, circle the letter of the single best answer. In Sections B and C, show your working and write in clear sentences.

Structure:

- **Section A** — Multiple choice: 20 questions, 2.5 marks each (**50 marks**).
- **Section B** — One analytical problem in five parts (**30 marks**).
- **Section C** — One short interpretation (**20 marks**).

Useful formulas. Solow: $\Delta K_{t+1} = \bar{s}Y_t - \bar{d}K_t$; steady state $k^* = (\bar{s}\bar{A}/\bar{d})^{3/2}$, $y^* = \bar{A}^{3/2}(\bar{s}/\bar{d})^{1/2}$; Romer $g_y = \bar{z}\bar{\ell}\bar{L}$; Jones $g_y = \lambda\bar{n}/(1 - \phi)$; bathtub $u^* = \frac{\bar{s}}{\bar{s} + \bar{f}}$, average spell = $1/\bar{f}$; quantity theory $M_tV_t = P_tY_t$, $\pi = g_M + g_V - g_Y$ (with $g_V = 0$: $\pi = g_M - g_Y$); Fisher $i = r + \pi^e$; $PDV = X/(1 + R)^T$.

Section A: Multiple Choice

(20 questions $\times$ 2.5 marks = 50 marks)

1. In the Solow model, the capital stock changes according to $\Delta K_{t+1} = \bar{s}Y_t - \bar{d}K_t$. The two terms on the right are:

- (A) consumption and investment.
- (B) taxes and government spending.
- (C) new investment and depreciation.
- (D) exports and imports.

2. The Solow economy reaches its steady state at exactly the capital stock where:

- (A) total output exactly equals consumption.
- (B) household saving equals total consumption.
- (C) new investment equals depreciation.
- (D) the capital stock equals the labour force.

3. Once a Solow economy has reached its steady state, the growth rate of income per person from capital accumulation alone is:

- (A) about 2% a year.
- (B) zero.
- (C) equal to the saving rate.
- (D) slowly declining.

4. A country permanently raises its saving rate $\bar{s}$. According to the Solow model, in the long run this produces:

- (A) a permanently faster rate of growth in income per person.
- (B) a higher level of income, with growth returning to zero.
- (C) a permanently lower stock of capital and income per person.
- (D) no change of any kind in either the level or the growth rate.

5. Germany and Japan grew unusually fast in the decades just after 1945. In the Solow model this is because:

- (A) an economy far below its resting point grows fast as it returns.
- (B) wartime destruction permanently raises productivity.
- (C) their saving rates fell sharply in the years after the war.
- (D) their steady states themselves had been destroyed by the war.

6. In the data since 1960, incomes have clearly converged:

- (A) across essentially every country in the world, rich and poor alike.
- (B) nowhere in the data, whether among rich countries or poor ones.
- (C) among the rich (OECD) countries, but not across the whole world.
- (D) only among the very poorest countries in the world sample.

7. The Golden Rule saving rate, the one that maximises long-run consumption per person, equals:

- (A) capital's share of income, one-third.
- (B) labour's share of income, two-thirds.
- (C) the depreciation rate of capital.
- (D) one-half of national income.

8. An idea, unlike a machine, is *nonrival*. This means:

- (A) it is expensive to produce the first time.
- (B) the law can prevent others from using it.
- (C) it wears out with intensive use.
- (D) any number of people can use it at the same time.

9. In the bathtub model, the separation rate is $\bar{s} = 1\%$ per month and the job-finding rate is $\bar{f} = 19\%$ per month. The natural rate of unemployment is:

- (A) 1%.
- (B) 19%.
- (C) 20%.
- (D) 5%.

10. If the job-finding rate is $\bar{f} = 25\%$ per month, the average completed spell of unemployment lasts about:

- (A) one month.
- (B) four months.
- (C) twenty-five months.
- (D) one year.

11. During a deep recession, many discouraged workers stop searching for jobs. As a result, the measured unemployment rate can:

- (A) rise even though hiring is strong.
- (B) fall even though nobody found a job.
- (C) never change.
- (D) exceed the participation rate.

12. Since about 1980, European unemployment has sat well above American unemployment. The bathtub-model account taught in the lecture is:

- (A) Europeans lose their jobs much more often than Americans do.
- (B) Europe's labour force is considerably older than America's.
- (C) Europe's unemployed take longer to find the next job.
- (D) America measures its unemployment in a more flattering way.

13. Laws that make dismissing a worker very costly reduce job separations, yet they can *raise* the natural rate of unemployment, because they also:

- (A) increase the size of the labour force year after year.
- (B) raise the separation rate for the workers who remain.
- (C) shrink the working-age population steadily over time.
- (D) make firms slower to hire, cutting the job-finding rate.

14. In 1914 Henry Ford doubled his workers' pay to five dollars a day, and turnover and absenteeism collapsed. The lecture uses this episode to illustrate:

- (A) the minimum wage.

- (B) collective bargaining.
- (C) the lump-of-labour fallacy.
- (D) efficiency wages.

15. Money grows at 8% a year, real output grows at 3%, and velocity is constant. Long-run inflation is:

- (A) 11%.
- (B) 5%.
- (C) 8%.
- (D) 3%.

16. “Money is neutral” is a claim that, *in the long run*, doubling the money supply:

- (A) doubles prices and changes no real quantity.
- (B) doubles both prices and real output.
- (C) halves the price level in the long run.
- (D) doubles real output while prices stay fixed.

17. The real interest rate is 2% and expected inflation is 4%. By the Fisher equation, the nominal interest rate is:

- (A) 2%.
- (B) 8%.
- (C) 6%.
- (D) -2%.

18. Inflation turns out much higher than anyone expected. The main redistribution is from:

- (A) lenders to borrowers.
- (B) borrowers to lenders.
- (C) young workers to old workers.
- (D) exporters to importers.

19. The *inflation tax* is paid mainly by:

- (A) owners of shares, gold and real estate.
- (B) firms that export most of their production.
- (C) workers whose wages are indexed to prices.
- (D) people holding cash and fixed nominal claims.

20. “Inflation is always and everywhere a monetary phenomenon” (Friedman), yet “persistent high inflation is always and everywhere a fiscal phenomenon” (Sargent). These two claims are:

- (A) compatible: money is the mechanism, the budget is the motive.
- (B) contradictory: at most one of the two claims can be true.
- (C) statements about the short run only, with no long-run content.
- (D) both rejected by the historical evidence on inflations.

Section B: Analytical Problem (30 marks)

Consider one economy, examined desk by desk. Its production side follows the Solow model with $\bar{s} = 0.3$, $\bar{A} = 1$, $\bar{d} = 0.1$. Its labour market has a monthly separation rate $\bar{s}_\ell = 1.5\%$ and a monthly job-finding rate $\bar{f} = 28.5\%$. Its central bank lets money grow at $g_M = 9\%$ a year while real output grows at $g_Y = 4\%$; velocity is constant. The long-run real interest rate is $r = 3\%$.

- (a) [6 marks] Find the steady-state capital per person k^* and income per person y^* .
- (b) [6 marks] The government doubles the saving rate to $\bar{s} = 0.6$. Find the new y^* , state the percentage gain, and explain in one sentence what happens to the *growth rate* of income per person in the long run.
- (c) [6 marks] Find the natural rate of unemployment u^* and the average length of an unemployment spell.
- (d) [6 marks] Find the long-run inflation rate, and the nominal interest rate implied by the Fisher equation (take expected inflation equal to your answer).
- (e) [6 marks] Inflation instead comes in at 9%, surprising everyone. Compute the ex-post real return earned by someone who lent at the nominal rate from part (d), and say who gained and who lost.

Section C: Interpretation (20 marks)

Read the following and answer in **no more than five sentences**. Use the concepts from the course; you do not need any calculation.

A laboratory spends two and a half billion dollars, over a decade, discovering the formula for a new vaccine. Once the formula exists, any competent factory can produce a dose for about two dollars, and the formula itself can be used by every factory on Earth at the same time without being used up. A politician argues: “The formula already exists, and copying it costs nothing. The fair policy is to let every producer use it immediately, free of charge, so each dose sells at two dollars.”

Question [20 marks]. Using the economics of ideas from the course, explain what is right about the politician’s reasoning, what it overlooks, and why societies deliberately grant temporary monopolies (patents) over discoveries like this one. Answer in at most five sentences.