

MACROECONOMICS 2026

SHANGHAI JIAO TONG UNIVERSITY

SUMMER SCHOOL 2026

MIDTERM EXAMINATION

Reading time: 10 minutes. **Writing time:** 120 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. Rule of 70: doubling time $\approx 70/g$; growth rates: products add, ratios subtract, powers multiply; production $Y = \bar{A}K^{1/3}L^{2/3}$, per person $y = \bar{A}k^{1/3}$; Solow $\Delta K_{t+1} = \bar{s}Y_t - \bar{d}K_t$, $k^* = (\bar{s}\bar{A}/\bar{d})^{3/2}$, $y^* = \bar{A}^{3/2}(\bar{s}/\bar{d})^{1/2}$, $K^*/Y^* = \bar{s}/\bar{d}$; growth accounting $g_{Y/L} = \frac{1}{3}g_{K/L} + g_{TFP}$; Romer $g_y = \bar{z}\bar{\ell}\bar{L}$; Jones $g_y = \lambda\bar{n}/(1 - \phi)$; bathtub $u^* = \bar{s}/(\bar{s} + \bar{f})$ (here $\bar{s}$ = separation rate, $\bar{f}$ = job-finding rate), spell = $1/\bar{f}$; Okun: each point of u above the natural rate u^* goes with output about 2% below potential; quantity theory $M_t V_t = P_t Y_t$, $\pi = g_M + g_V - g_Y$; Fisher $i = r + \pi^e$; budget (simplified) $G = T + \Delta B + \Delta M$.

Section A: Multiple Choice

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

1. Which of the following adds to this year's GDP?

- (A) A car retailer sells a vehicle that was produced two years ago.
- (B) The government pays unemployment benefit to a worker.
- (C) A household buys newly issued shares in a technology fund.
- (D) A firm produces goods this year that remain unsold in its warehouse.

2. An economy produces the same quantities in two consecutive years, but every price rises by 5%. Real GDP growth between the two years is:

- (A) 0%.
- (B) 5%.
- (C) -5%.
- (D) 2.5%.

3. A country grows at 3.5% per year. By the Rule of 70, its income doubles roughly every:

- (A) 35 years.
- (B) 70 years.
- (C) 20 years.
- (D) 10 years.

4. A country's price level is half the United States level. Converting its GDP to dollars at the market exchange rate, rather than at common (PPP) prices:

- (A) overstates its real output by half.
- (B) leaves its real output correctly measured.
- (C) understates its real output by about half.
- (D) doubles its measured population.

5. Total GDP equals GDP per person multiplied by population. If total GDP grows at 5% and population at 2%, GDP per person grows at about:

- (A) 7%.
- (B) 3%.
- (C) 2.5%.
- (D) 10%.

6. With the production function $Y = \bar{A}K^{1/3}L^{2/3}$, doubling *both* capital and labour:

- (A) more than doubles output.
- (B) exactly doubles output.
- (C) less than doubles output.
- (D) leaves output unchanged.

7. Development accounting attributes the large income gaps between rich and poor countries mostly to:

- (A) the stock of capital per person.
- (B) endowments of natural resources.
- (C) total factor productivity.
- (D) the size of the population.

8. A Solow economy has $\bar{s} = 0.2$, $\bar{A} = 1$, $\bar{d} = 0.05$. Its steady-state capital and income per person are:

- (A) $k^* = 4$, $y^* = 1.6$.
- (B) $k^* = 2$, $y^* = 1.3$.
- (C) $k^* = 16$, $y^* = 4$.
- (D) $k^* = 8$, $y^* = 2$.

9. In the Solow model *without* technological progress, the long-run growth rate of income per person is:

- (A) positive but small.
- (B) equal to the saving rate.
- (C) negative.

(D) exactly zero.

10. In the Solow steady state, the capital-output ratio K^*/Y^* equals:

(A) $\bar{s}/\bar{d}$.

(B) $\bar{d}/\bar{s}$.

(C) $\bar{A}^{3/2}$.

(D) one-third.

11. In Romer's model, doubling the *number of researchers* permanently doubles the growth rate. The evidence is against this, because:

(A) research employment has been falling steadily for decades.

(B) growth rates doubled even though research employment stayed flat.

(C) ideas cannot be shared across national borders at all.

(D) research effort rose many times over while growth stayed near 2%.

12. In the semi-endogenous (Jones) model, $g_y = \lambda\bar{n}/(1 - \phi)$, a permanent government subsidy that raises the *share* of workers in research:

(A) raises the level of income but not the long-run growth rate.

(B) raises the long-run growth rate of income permanently.

(C) lowers the level of income along the entire future path.

(D) has no effect of any kind on either level or growth.

13. The bathtub model with separation rate $\bar{s} = 2\%$ and job-finding rate $\bar{f} = 23\%$ per month gives a natural rate of unemployment of:

(A) 2%.

(B) 23%.

(C) 8%.

(D) 11.5%.

14. A student who is not working and not looking for work is counted as:

(A) unemployed.

- (B) out of the labour force.
- (C) employed.
- (D) a discouraged worker in the unemployment rate.

15. Long-lasting unemployment caused by the rules of the labour market itself, such as high firing costs and long, generous benefits, is called:

- (A) structural unemployment.
- (B) frictional unemployment.
- (C) cyclical unemployment.
- (D) voluntary leisure.

16. The quantity equation $M_t V_t = P_t Y_t$ becomes a *theory* of the price level once we add the assumptions that:

- (A) money and prices are both set by parliament.
- (B) velocity is stable and real output is set by the real side.
- (C) velocity rises mechanically whenever inflation rises.
- (D) real output is strictly proportional to the money supply.

17. Money grows at 12% and real output at 2%, with stable velocity. Long-run inflation is:

- (A) 14%.
- (B) 12%.
- (C) 6%.
- (D) 10%.

18. In the government budget identity $G = T + \Delta B + \Delta M$, a government resorts to the ΔM term, printing money, when:

- (A) its central bank targets low inflation.
- (B) its tax revenues are running unusually strong.
- (C) it can neither raise taxes nor borrow more.

(D) its outstanding debt has just been fully repaid.

19. Beyond some point, printing money even faster *reduces* the government's real revenue from the inflation tax, because:

(A) the central bank physically runs out of paper and ink.

(B) people flee from cash, shrinking the base the tax is levied on.

(C) prices eventually stop responding to the money supply.

(D) commercial banks refuse to accept new deposits.

20. The United States inflation of the 1970s, unlike the classic hyperinflations, is best described as:

(A) a policy mistake, ended by determined monetary tightening.

(B) a fiscal collapse financed by the printing press.

(C) a delayed consequence of leaving the gold standard.

(D) a statistical illusion in the price indexes.

Section B: Analytical Problem (30 marks)

An economy is described piece by piece. Its production function is $Y = \bar{A}K^{1/3}L^{2/3}$ with $\bar{A} = 10$, $K = 27$, $L = 8$. For the long run it behaves as a Solow economy with $\bar{s} = 0.25$, $\bar{A}_S = 1$, $\bar{d} = 0.05$ (per-person units). Its central bank lets money grow at 7% while real output grows at 2%, with stable velocity; the long-run real interest rate is 2%.

- (a) [6 marks] Compute output Y , and the incomes paid to capital and to labour under competitive markets.
- (b) [6 marks] A neighbouring country has *27 times* this economy's capital per worker but the same productivity. Development accounting: by what factor does capital alone predict it is richer per worker? If it is actually *6 times* richer, what is its relative TFP, and how does the income gap split between capital and productivity?
- (c) [6 marks] In the Solow block, find the steady-state income per person y^* and the steady-state capital-output ratio.
- (d) [6 marks] Growth accounting: capital per worker grows at 3% a year and TFP at 1%. Find the growth of output per worker, and state which component dominates in the long run and why.
- (e) [6 marks] Find long-run inflation and the Fisher nominal interest rate. If inflation then arrives at exactly the expected rate, who gains from the loans written at that nominal rate: borrowers, lenders, or neither?

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 country emerges from a war with its factories damaged, its tax offices barely functioning, and lenders unwilling to buy its bonds. Yet the government faces enormous bills for reconstruction and pensions. Within two years, prices are doubling every few weeks; workers insist on being paid daily and spend their wages within hours. The government blames merchants for greed and imposes strict price controls, but shortages spread and inflation resumes the moment controls are lifted. Then, in a single season, a reform programme ends the inflation almost overnight, and prices are stable within months.

Question [20 marks]. Using the tools of Lecture 6, explain where this inflation actually came from, why blaming merchants and imposing price controls failed, and what the successful reform programme must have contained for the inflation to stop so suddenly. Answer in at most five sentences.