香港科技大學
THE HONG KONG UNIVERSITY OF SCIENCE AND TECHNOLOGY

EXAMINATION *Answer Book*

Please complete the following :

Course Code : Econ 3123

Course Title : Macroeconomics Theory I

Date of Examination : 10/10/2025

Student Number : 21166453

Student Name : LAI CHUN HEI

THE HKUST ACADEMIC HONOR CODE

Honesty and integrity are central to the academic work of HKUST. Students of the University must observe and uphold the highest standards of academic integrity and honesty in all the work they do throughout their program of study.

As members of the University community, students have the responsibility to help maintain the academic reputation of HKUST in its academic endeavors.

Sanctions will be imposed on students, if they are found to have violated the regulations governing academic integrity and honesty

Declaration of Academic Integrity

I confirm that I have answered the questions using only materials specifically approved for use in this examination, that all the answers are my own work, and that I have not received any assistance during the examination.

Student's Signature :

Instructions :

1. Write your answers on the **RIGHT-HAND** page. Use the left-hand page only for rough work. Any work that appears on the left-hand page will **NOT** be marked.
2. Begin **EACH** question on a **NEW** page. Write down the question number at the top of each page.
3. No supplementary sheets may be submitted, unless allowed by the examiner.
4. No part of this answer book is to be taken away from the examination.

Enter the question numbers below in the **SAME ORDER** as you have answered the questions :

Question No.	For use by the examiner	
	Marks	
Total marks	92	

No. of answer books used : 2

Checked by Yeong Ln.

1) B
2) D
3) B
4) D
5) C

12

Question 6

6a) $C = c_0 + c_1 Y_D$

$= C_0 + c_1 (Y - T)$

$= c_0 + c_1 (Y - t_0 - t_1 Y)$

$C = c_0 + c_1 [Y(1 - t_1) - t_0]$

$Z = C + I + G$

$Z = c_0 + c_1 [Y(1 - t_1) - t_0] + b_0 + b_1 Y - b_2 i + G$

$Z = c_0 + Y[c_1(1 - t_1) + b_1] - c_1 t_0 + b_0 - b_2 i + G$

For equilibrium,

$Y = Z$,

$\therefore Y = c_0 + Y[c_1(1 - t_1) + b_1] - c_1 t_0 + b_0 - b_2 i + G$

$(1 - c_1 + t_1 - b_1) Y = c_0 - c_1 t_0 + b_0 - b_2 i$

$Y = \frac{1}{1 - c_1 + t_1 - b_1} (c_0 - c_1 t_0 + b_0 - b_2 i + G)$

In equilibrium,

$T = t_0 + t_1 \left[\frac{1}{1 - c_1 + t_1 - b_1} (c_0 - c_1 t_0 + b_0 - b_2 i)\right]$

$= \frac{t_0 - c_1 t_0 + t_0 t_1 - t_0 b_1 + t_1 (c_0 - c_1 t_0 + b_0 - b_2 i + G)}{1 - c_1 + t_1 - b_1}$

$= \frac{t_0 - c_1 t_0 (1 + t_1) + t_0 t_1 - t_0 b_1 + t_1 c_0 + t_1 b_0 + t_1 (G - b_2 i)}{1 - c_1 + t_1 - b_1}$

$= \frac{t_0 (1 - c_1 - b_1) + t_1 (c_0 + b_0 - c_1 t_0 + t_0 - b_2 i + G)}{1 - c_1 + t_1 - b_1}$

6b) (i) When there is a drop in b_0, there will be a drop in output and hence income. It finally leads to drop in Tax Income T of government.
∴ T will drop.

(People will have less income, they consume less. Investment also drop with output ∴ output drop further.)

(ii) Government should decrease G to maintain a budget balance while T decreases.

(iii) However, when G decrease, the output drop and the income will drop also, which reinforce the drop in output. (consumption and investment will drop also,)

/ 10

(cont'd)

9bc) In equilibrium, and also $T = G$

$I = S + T - G \Rightarrow I = S \quad -(*)$

First, $\Delta T = \frac{t_1}{1 - c_1 + t_1 - b_1} \Delta b_0$

Then, $\Delta G = \Delta T$

Therefore,

$$\Delta Y = \Delta G \frac{1}{1 - c_1 + t_1 - b_1} + \Delta b_0 \frac{t_1}{1 - c_1 + t_1 - b_1}$$

$$= \Delta b_0 \left(\frac{t_1}{(1 - c_1 + t_1 - b_1)^2} + \frac{t_1}{1 - c_1 + t_1 - b_1} \right)$$

∴ When b_0 drop, output will drop and it leads to greater drop in Investment

∴ I will drop.

By $(*)$

$I = S$, when I drop, S also drop.

∴ private saving drops.

5

Question 7

Q7a) $C = 0.5 + 0.2(Y-T)$, $I = 0.2 + 0.3Y - 2.5(i+x)$

$C = 0.3 + 0.2Y$, $I = 0.075 + 0.3Y - 2.5i$

$Z = C + I + G$

$Z = 0.3 + 0.2Y + 0.075 + 0.3Y - 2.5i + 1$

$Z = 1.375 + 0.5Y - 2.5i$

In equilibrium of goods market,

$Y = Z$

$Y = 1.375 + 0.5Y - 2.5i$

$0.5Y = 1.375 - 2.5i$

$Y = 2.75 - 5i$ //

10

Q7b) In equilibrium of monetary market,

$H = M^d$

$H = CU^d + R^d$

$H = M^d(c + g(1-c))$

$H = PY(0.7 - 4i)(c + g(1-c))$

$H = (2.75 - 5i)(0.7 - 4i)(c + g(1-c)) \times P$

When $i = \bar{i} = 5\%$

$H = (2.75 - 5(0.05))(0.7 - 4(0.05))(0.2 + 0.2(1-0.2)) \times 2$

$= 2.5 \times 0.5 \times 0.4 \times 2$

$= 1$ //

10

Q7c) When $g = 0.3$, keeping $i = \bar{i} = 5\%$

$H = (2.75 - 5i)(0.7 - 4i)(c + g(1-c)) \times P$

$= 2.5 \times 0.5 \times 2 \times (0.2 + 0.3 \times 0.8)$

$= 1.1$ //

5

(ca-1(d)

9(d) When $x = 0.15$

$I = 0.2 + 0.3Y - 2.5(i + 0.15)$

$= 0.3Y - 0.175 - 2.5i$

$Z = C + I + G$

$= 0.3 + 0.2Y + 0.3Y - 0.175 - 2.5i + 1$

$= 1.125 + 0.5Y - 2.5i$

In equilibrium,

$Y = Z$

$Y = 1.125 + 0.5Y - 2.5i$

$Y = 2.25 - 5i$, when $i = \bar{i} = 5\%$, $Y = 2.25 - 5 \times 0.05 = 2$

In equilibrium, and $i = \bar{i} = 5\%$

$H = H^d$

$= PY(0.7 - 4i)(c + d(1-t))$

$= 2 \times 2(0.7 - 4 \times 5\%)(0.2 + 0.3(0.8))$

$= 2 \times 2 \times 0.5 \times 0.44$

$= 0.88$ //

Question 8

8a) $$P_{2t} = \frac{100}{(1+i_{1t}+x)(1+i^e_{1t+1})}$$

$$= \frac{100}{(1+4\%+5\%)(1+3\%)}$$

$$= \$89.071$$

8b) $$P_{3t} = \frac{100}{(1+i_{1t}+x)(1+i^e_{1t+1}+x)(1+i^e_{1t+2})}$$

$$= \frac{100}{(1+4\%+5\%)(1+3\%+5\%)(1+2\%)}$$

$$= \$83.2817$$

8c) let i be the annual yield

$$\frac{100}{(1+i)^3} = 83.2817$$

$$i = 6.29\%$$

∴ the yield to the 3-year bond is 6.29%