

HOWARD UNIVERSITY
DEPARTMENT OF ECONOMICS

CODE NUMBER _____

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September 1, 2021

FALL 2021 M.A. MACROECONOMIC THEORY COMPREHENSIVE EXAMINATION

Examiners:

1. Dr. Mika Kato, Chairperson
2. Dr. Gerald Daniels
3. Dr. Tingting Xiong

1. The examination is scheduled between the hours: 9:30 a.m-1.00 pm

ALL STUDENTS ARE TO BE SEATED BY 9:25 a.m.

2. YOU ARE REQUIRED TO ANSWER ONLY FIVE (5) QUESTIONS.

Any additional questions answered over the required number from each category will NOT receive credit.

3. Correct answers to questions NOT asked will receive NO credit.
4. Be sure to write the Code Number assigned to you in the TOP LEFT HAND CORNER OF THIS SHEET AND ON EACH ANSWER SHEET. DO NOT WRITE YOUR NAME ON ANY SHEET OF THE EXAMINATION.
5. Begin each question on a new page. Number each page used in sequence. Write only on one side of the paper.
6. Write clearly and illustrate your answers with graphs whenever and wherever possible.
7. USE ONLY BLACK INK PENS.
8. At the end of the examination, please indicate the total number of pages being submitted in the space provided in the TOP RIGHT HAND CORNER of this sheet.

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1. Bring your pens, pencils, calculators and rulers.
2. No briefcases, book bags or sacks, no handbags larger than 10 x 6 of any form are to be brought into the examination room.
3. No books, notes or other study material are to be brought into the examination room.
4. During the Examination there is to be no communication between or amongst students for any purpose. All questions must be directed to and channeled through the faculty member conducting the examination.
5. Only the scrap paper provided by the proctor is to be used for the examination. Scrap paper should bear the code number assigned to each student, and be handed over to the proctor along with the examination.
6. Students are not expected to leave the examination room before completing their examination and turning it in to the proctor.
7. NO FOOD OR SMOKING is permitted in the examination room.
8. It is the student's responsibility to remove any coffee or water containers taken into the examination room.
9. NO CELL PHONES ARE ALLOWED.
10. EXAMINATION RESULTS WILL ONLY BE GIVEN TO STUDENTS WHO ARE REGISTERED.

CODE NUMBER _____

**STUDENTS: PLEASE CIRCLE ONLY THE QUESTIONS ANSWERED
AND PROVIDE THE PAGE NUMBERS.**

QUESTIONS	PAGE NUMBERS
1.	
2.	
3.	
4.	
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7.	
8.	

FALL 2021 M.A. MACROECONOMIC THEORY COMPREHENSIVE EXAMINATION

PART A. ANSWER ALL THREE (3) QUESTIONS 1-3.

1. Write short definitions for (a)-(g). Use diagrams and/or equations where appropriate.

- (a) Physical Capital
- (b) Expansionary fiscal policy
- (c) Golden rule
- (d) Real rental rate of capital
- (e) Closed Economy
- (f) National Income Identity
- (g) Recession

2. Answer questions (a)-(e).

Suppose we have production function $F(k_t) = Ak_t^\alpha$ where k denotes the capital stock, $\alpha = .5$ and $A = 10$,

- (a) why do we assume $k_t > 0$?
- (b) What is the capital accumulation equation? How do we interpret this equation?
- (c) Show that $F(k_t) > 0$ for $k_t > 0$?
- (d) Show that $F'(k_t) > 0$ for $k_t > 0$?
- (e) Show that $F''(k_t) < 0$ for $k_t > 0$?
- (f) Show this function satisfies the Inada conditions?

3. Be sure to use diagrams as well as a written explanation when answering this question. According to the IS-LM model and Aggregate Demand and Supply model, what happens to the interest rate, income, consumption, investment, prices, and unemployment rate in the short run and long run under the following scenarios:

Answer questions (a)-(c).

- (a) Congress pursues expansionary fiscal policy to combat COVID-19 recession.
- (b) Fed decides to pursue contractionary monetary to combat inflation.
- (c) Congress decides to reduce government expenditure to combat rising deficits.

PART B. ANSWER ANY TWO (2) QUESTIONS FROM QUESTIONS 4-8.

4. Suppose that the following equations describe a closed economy:

$C(Y - T) = 8000 + 0.25(Y - T)$	Consumption Function
$I(r) = 2000 - 50r$	Investment Function
$T = 1000$	Taxes
$G = 250$	Government Spending
$L(r, Y) = .5Y - 50r$	Demand for Real Money Balances
$M = 8,000$	Money Supply
$P = 4$	Price Level

Answer questions (a)-(c).

- (a) Given the information above, drive an equation for the IS curve for the economy.
Express the IS curve as $r(Y)$.
- (b) Given the above equations, drive an equation for the LM curve for the economy.
Express the LM curve as $r(Y)$.
- (c) Solve for the equilibrium interest rate and output using the IS curve derived in (a) and the LM curve derived in (b).

5. Assume that an economy's production function is described by $F(k_t) = k_t^\alpha$. In addition, we assume that the aim of the central planner is to maximize the present value of current and future utility,

$$\max_{\{c_{t+s}, k_{t+s}\}} V_t = \sum_{s=0}^{\infty} \beta^s \log c_{t+s} \text{ and } \beta = \frac{1}{1 + .05}$$

and the production function is given by $F(k_t) = 10k_t^{1/3}$, c_{t+s} denotes the level of consumption in period $t + s$, and depreciation rate of capital is given by $\delta = .05$.

Answer questions (a)-(d).

- (a) Write the resource constraint for a closed economy with no government.
- (b) Define the Lagrangian for the centralized economy.
- (c) Determine the first order conditions for (b).
- (d) Derive the optimal long-run, i.e. steady state, solution for capital, k , consumption, c , and investment, i .

6. Assume that households can decide between work, n , and leisure, l , where the sum of work and leisure hours is normalized to one, i.e. $1 = n_{t+s} + l_{t+s}$ for all s . Suppose the net present value for household utility is given by:

$$V_t = \sum_{s=0}^{\infty} \beta^s [\log(c_{t+s}) + \log(l_{t+s})] \text{ and } \beta = \frac{1}{1 + .05}$$

and the economy's production function is given by

$$F(k_{t+s}, n_{t+s}) = 10k_{t+s}^{1/3}n_{t+s}^{2/3}$$

and the depreciation rate of capital is given by $\delta = .05$.

Answer questions (a)-(c).

- (a) Define the Lagrangian for the centralized economy.
- (b) Determine the first order conditions for (a)
- (c) Derive the optimal long-run, i.e. steady state, solution for capital, k , consumption, c , investment, i , labor, n , and leisure, l .

7. Suppose household present value of current and future utility is given by

$$V_t = U(c_t, l_t) + \beta U(c_{t+1}, l_{t+1})$$

and the resource and labor-leisure constraints in period t are given by

$$\begin{aligned} F(k_t, n_t) &= c_t + k_{t+1} - (1 - \delta)k_t \\ 1 &= n_t + l_t \end{aligned}$$

Answer questions (a)-(d).

- (a) Take the total differential of V_t .
- (b) Using (a), if V_t and leisure in period t and $t + 1$ remain constant, determine and explain the relationship between consumption today, t , and tomorrow, $t + 1$.
- (c) Using (a), if V_t and consumption and leisure in period $t + 1$ remain constant determine and explain the relationship between consumption and leisure today, t .
- (d) Take the total differential of the labor-leisure constraint, explain the relationship between labor and leisure today, t .

8. Suppose the economy's production function is given by

$$F(K_t, N_t) = AK_t^\alpha N_t^{1-\alpha},$$

where number of workers is given by $N_t = (1 + n)^t$. The growth rate of technology and number of workers is positive, i.e., $n > 0$.

Answer questions (a)-(d).

- (a) Show the production function is homogenous of degree 1.
- (b) Write the production function in per capita terms.
- (c) Write the capital accumulation equation in per capita terms.
- (d) Derive the optimal long-run, i.e. steady state, solution for capital per capita.