HOWARD UNIVERSITY

DEPARTMENT OF ECONOMICS

CODE NUMBER _____ **TOTAL NUMBER OF PAGES _____**

August 29, 2023

FALL 2023 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.

CODE NUMBER _____

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

QUESTIONS	**PAGE NUMBERS**
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	

HOWARD UNIVERSITY

DEPARTMENT OF ECONOMICS

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.

FALL 2023 M.A. MACROECONOMIC THEORY COMPREHENSIVE EXAMINATION

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

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

   (a) Physical Capital
   (b) Labor
   (c) Gross Domestic Product
   (d) Gross Domestic Product per capita
   (e) Real wage
   (f) Inflation
   (g) Monetary Policy
   (h) Nominal rental rate of capital

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

   Suppose the production function in a country is given by $F(K, L) = \sqrt{KL}$ where K denotes the capital stock, L amount of labor, and the economy begins with 100 units of capital and 100 units of labor.

   (a) How much output does the economy produce?
   (b) What are the returns to scale for the production function?
   (c) If a plague kills half the population, what is the new level of output?
   (d) Calculate the marginal product of capital when $K = 100$ and $L = 100$.
   (e) Calculate the real wage when $K = 100$ and $L = 100$.

3. **Be sure to use diagrams as well as a written explanation when a 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) Fed decides to pursue contractionary monetary policy to combat inflation.
   (b) Congress decides to increase taxes to combat rising deficits.
   (c) Fed decides to pursue contractionary monetary policy while congress decides to increase taxes 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:

$C(Y - T) = .5(Y - T) + 30$	Consumption Function
$I(r) = 22 - r$	Investment Function
$T = 30$	Taxes
$G = 10$	Government Spending
$L(r, Y) = .5Y - r + 12$	Demand for Real Money Balances
$M = 350$	Money Supply
$P = 7$	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. Let's assume the economy's production function must satisfy the following assumptions:

i. is positive for positive values of capital.
ii. is increasing in capital at a diminishing rate.
iii. satisfies the Inada conditions for $k \to 0$ and $k \to \infty$.

Answer questions (a)-(c).

Determine if the following functions satisfy our model assumptions about the production function:

(a) $F(k) = \ln(k)$
(b) $F(k) = 15k^3 + 10$
(c) $F(k) = 15k^{2/5} + 15$

6. Suppose an economy that is coordinated by a social planner. The Capital accumulation equation is given by:

$$\Delta k_{t+1} = i_t - \delta k_t$$

Output for the economy is determined by

$$y_t = F(k_t) = Ak_t^{\alpha}$$

where $A = 10,\ \alpha = .4,$ and depreciation rate of capital is given by $\delta = .02$.

Answer questions (a)-(c).

(a) Provide the resource constraint.
(b) Determine the golden rule solution for capital, k, output, y, consumption, c, and investment, i.
(c) Under the golden rule, what happens to capital, k, output, y, consumption, c, and investment, i, if the level of technology improves, now $A = 20$.

7. Suppose an economy that is coordinated by a social planner has the following total utility function:

$$\mathrm{V}(c_t, c_{t+1}) = .5 \log c_t + \beta \cdot .5 \log c_{t+1}.$$

The discount factor is $\beta = \frac{1}{1+\theta}$, and the discount rate is $\theta = .02$, and the resource constraint in each period are given by:

$$F(k_t) = c_t + k_{t+1} - (1-\delta)k_t \quad \text{and}$$
$$F(k_{t+1}) = c_{t+1} + k_{t+2} - (1-\delta)k_{t+1}.$$

Assume the following:

i. $k_{t+2} = 0$
ii. $F(k_t) = 10k_t$ Production function in period t
iii. $F(k_{t+1}) = 10k_{t+1}$ Production function in period t+1
iv. $\delta = .02$ Depreciation Rate

Answer questions (a)-(d).

(a) Does the production function in both periods display diminishing marginal returns to capital.
(b) Assume consumption is constant over time, $c_t = c_{t+1} = c$, determine the optimal level of consumption, c, and capital in period $t+1$, i.e., k_{t+1}.
(c) Comparing your answer to (b), what happens to the optimal level of consumption as the depreciation rate increases?
(d) Comparing your answer to (b), what happens to the optimal level of capital in period $t+1$ as the discount rate decreases?

8. Assume the depreciation rate for the physical capital stock is δ = .08. For each production function below, determine the Golden Rule solution for capital, consumption, and output for the economy in the steady state.

Answer questions (a)-(d).

(a) $F(k_t) = 100{k_t}^{1/2}$
(b) $F(k_t) = \ln k_t$
(c) $F(k_t) = 100{k_t}^{1/2}$
(d) $F(k_t) = \ln {k_t}^2$