HOWARD UNIVERSITY

DEPARTMENT OF ECONOMICS

CODE NUMBER-------------　　　TOTAL NUMBER OF PAGES----------

September 5, 2018

COMPREHENSIVE EXAMINATION:

MACROECONOMIC THEORY/ Ph.D.

EXAMINERS:

1. **Dr. Mika Kato, Chairperson**
2. **Dr. Gerald Daniels**
3. **Dr. Gaminie Meepagala**

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

   ALL STUDENTS ARE TO BE SEATED BY 9:15 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.**

Revised 09/07/2004

CODE NUMBER___________

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

QUESTIONS	**PAGE NUMBERS**
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PH.D. MACROECONOMIC THEORY
COMPREHENSIVE EXAMINATION SPRING 2018

ANSWER ANY FIVE (5) QUESTIONS.

1. **Explain (a)-(f). You may use a simple model and/or a graph if appropriate.**

   (a) Money is neutral.
   (b) Efficiency-wage hypothesis.
   (c) Relative risk aversion.
   (d) Creative destruction.
   (e) Accelerationist Phillips curve.
   (f) Arrow (1962)'s learning by doing.

2. **Consider a simple investment problem. A firm maximizes its present value of profit:**

$$max \int_{t=0}^{\infty} \{\pi(K) - I - \varphi(I)\} e^{-rt} dt$$
$$s.t. \ \ \dot{K} = I$$

   where r is the interest rate, π is the firm's profit function, K is the capital stock, I is the investment, and φ is the adjustment cost of investment.

   Answer questions (a)-(c).

   (a) Write down the firm's problem to find the optimal investment to maximize its present value of profit.
   (b) Show the first-order necessary conditions for maximization.
   (c) Find the optimal investment rule. Show that the derived rule is actually compatible with the Tobin's q (Tobin, 1969) theory of investment.

3. **Answer questions (a)-(c).**

   (a) The Solow-Swan model predicts the so-called conditional convergence. Explain.
   (b) How can we give an empirical test of conditional convergence? Write down your idea and an econometric model.
   (c) Quah (1996, 1997) has shown that the world distribution of per-capita income is becoming more and more "twin peaked". Can conditional convergence explain this fact? Explain.

4. Consider a Central Bank (CB) whose objective is to minimize the social-welfare loss. Assume a quadratic social welfare loss function,

$$L = \frac{1}{2}(y - y^*)^2 + \frac{1}{2}a(\pi - \pi^*)^2,$$

and an expectation-augmented Phillips curve,

$$y = \bar{y} + b(\pi - \pi^e),$$

where y is the real output, $\bar{y}$ is the natural output, y^* is the target output ($y^* > \bar{y}$), π is the inflation, π^* is the target inflation, and π^e is the expected inflation.

Answer questions (a)-(d).

(a) How do you interpret the parameter a in the loss function? What does a larger value of a mean?
(b) Assume that the policy maker makes a binding commitment about inflation. Derive the policy maker's optimal response, the level of actual inflation, π, and the level of actual output, y, in the economy.
(c) Now assume that a policy can be set by discretion. Derive the policy maker's optimal response function, the level of inflation, π, and the level of output, y, in equilibrium.
(d) Show that a discretionary monetary policy leads to a dynamic inconsistency problem.

5. Suppose that the economy's production function is

$$Y = \sqrt{K}\sqrt{LA}$$

where K is capital, L is labor, and A is the state of technology.

Suppose that the saving rate (s) is equal to 2.4%, the rate of depreciation of capital (δ) is equal to 3%, the number of workers grow at 0.7% per year and the rate of technological progress is 3%.

Answer questions (a) and (b).

(a) Find the steady state values of:
   i. capital stock per effective worker
   ii. output per effective worker
   iii. growth rate of output per effective worker
   iv. growth rate of output per worker
   v. growth rate of output
(b) Suppose that the growth rate of workers decreases. Study its short-run and the long-run effect on the *growth rate* of output per worker.

6. **Consider a Ramsey-Cass-Koopmans model where a representative agent consumes and engages in production for $t \in [0, \infty)$. The agent's utility depends on its current consumption $u(c_t)$ and its production technology is $y_t = f(k_t)$. Both functions have usual properties.**

   Answer questions (a)-(d).

   (a) Write down the representative agent's problem to find the optimal consumption to maximize the present-value of utility when its subjective discount rate is ρ and the depreciation rate of capital is δ.
   (b) Show the first-order necessary conditions for maximization.
   (c) Using a phase diagram, show that there is a unique steady state and that the steady state is stable.
   (d) Show that the golden rule capital stock is not guaranteed in the steady state.

7. **Consider a closed economy described by**

   $Y = E(Y, r, G, T); \quad 0 < E_Y < 1, E_r < 0, E_G > 0, E_T < 0$ **(IS)**
   $r = r(Y, \pi); \quad r_Y > 0, r_\pi > 0$ **(Taylor rule)**

   Answer questions (a)-(d).

   (a) Show the multiplier effect, i.e., $\left.\frac{\partial Y}{\partial G}\right|_{IS} > 1$, using the given IS equation.
   (b) Why it is said that Taylor rule is more realistic than the traditional LM equation as a description of money market.
   (c) Analyze the effect of an inflation rise on the equilibrium output and real interest rate.
   (d) Derive the aggregate demand (AD) equation from the above model and show that the AD curve is negatively sloped.

8. **Answer questions (a)-(c).**

   (a) What is the engine of growth in Romer (1990)'s product variety growth theory and in the Schumpeterian growth theory?
   (b) Compare it to the element driving endogenous growth in the neoclassical theory. What does this comparison imply in terms of pro-growth policy design in both settings?
   (c) Both the product-variety and the Schumpeterian models predict scale effects, namely, that a larger population (a larger population of researchers) would predict faster growth. Is this prediction problematic? How would you empirically test this prediction?