

**National University of Lesotho**  
**B.A. Examinations – Supplementary**  
**EC3302: Macroeconomics Analysis**

**August 2023**

**100 Marks**

**3 Hours**

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**INSTRUCTIONS:**

- 1.** Answer **any 4** questions.
- 2.** All computations should be to two decimal places.

### Question One

- a) Mathematically determine demand, supply and the labour market equilibrium in a two-sided search model of Unemployment. **[12 marks]**
- b) Differentiate between a soft peg and a hard peg of a fixed exchange rate system and explain 3 scenarios in which a hard peg could be formed. **[9 marks]**
- c) In the Solow growth model with population growth, suppose that the per-worker production function is given by  $y = zk^{0.4}$ , with  $s = 0.6$ ,  $d = 0.03$ , and  $n = 0.04$ . Suppose that in country A,  $z = 5$ . Calculate per capita income and capital per worker. **[4 marks]**

### Question Two

- a) Assume that the CEO of Phallo Cooperations is interested in understanding at what point the firm should no longer reinvest – the point of optimal investment. Based on your application for a job and your conviction that you are a trained economist, he gives you the assignment to derive the choice of optimal investment. Considering that at time zero (current time), the firm chooses an investment path that maximizes the present value (PV) of current and future profits.

Assuming an infinite time horizon, the present value of the profits of the firm is equal to

$$PV(0) = \int_{t=0}^{\infty} e^{-rt}(Y(t) - I(t) - \psi(I(t)))dt \quad \text{and}$$
$$Y(t) = AF(K(t))$$

where  $r$  is the real interest rate assumed exogenous and constant;  $Y(t)$  is income,  $I(t)$  is investment and  $AF(K(t))$  is the production function at time  $t$ .

- i. Derive the Choice of Optimal Investment. **[7 marks]**
- ii. State clearly the requirement for the Choice of Optimal Investment. **[3 marks]**
- iii. Does the point of optimal investment translate to a steady state? Explain. **[5 Marks]**
- b) Assume that the government's goal is to reduce the unemployment rate in Lesotho. Some legislators propose that the government should give a subsidy  $s$  to any firm that hires a worker. Some other legislators argue that it would be more effective to simply pay consumers to stay home rather than search for work, that is, anyone who chooses not to participate in the labor force should receive a payment  $q$ .

Explain, with the aid of diagrams, which policy is more effective in achieving the government's goal. In your answer, do not concern yourself with how the subsidies from the government are financed. **[10 marks]**

### Question Three

A consumer's current income ( $y$ ) is 120 and the future income ( $y'$ ) is 150. A current lump-sum tax ( $t$ ) of 10 is paid, and the tax in the next period ( $t'$ ) is 12. The real interest rate is 25% for each period.

- i. Calculate the consumer's lifetime wealth. **[3 marks]**
- ii. Assume a perfect complement case and calculate optimal current and future consumption and the optimal current and future savings. **[3 marks]**
- iii. Assume that the economy was on a tax holiday during the period covered for a perfect complement case. Compute the optimal current and future consumption and the optimal current and future savings. **[3 marks]**
- iv. Now, assume an imperfect complements case where  $c'$  is 10% higher than  $c$ . Calculate the optimal current and future consumption and the optimal current and future savings. **[3 marks]**
- v. Assume that the random walk hypothesis holds for cases (b) to (d) above. Calculate the random term for each of these cases. **[3 marks]**
- vi. State in each case whether the consumer is a lender or a borrower for questions (b) to (d). **[3 marks]**
- vii. In a perfect complement case where wealth increases by 45%, what will be the value of consumption? **[2 marks]**
- viii. The idea of lifetime wealth applies to only one of the 5 major consumption theories. Briefly state and explain what this theory posits. **[5 marks]**

### Question four

Mathematically derive the shadow value of an additional unit of capital –  $q$  of Tobin, and explain its determinants when investment is optimal. **[15 marks]**

A review of economic growth theories and growth empirics highlights 5 key policies to improve economic growth. Clearly discuss these 5 policies. **[10 marks]**

### Question five

- a) Graphically illustrate and explain the equilibrium level of employment according to the Classical and the Keynesians. **[8 marks]**
- b) Given  $Y = K^{\frac{1}{2}}N^{\frac{1}{2}}$  where  $Y$  is output,  $K$  is capital, and  $N$  is labour.
- Compute output per worker. **[3 marks]**
  - Assume that 40 percent of output is saved ( $s = 0.4$ ), that 10 percent of the capital stock depreciates every year ( $\delta = 0.1$ ), and that the economy starts off with 9 units of capital per worker ( $k = 9$ ); calculate output per worker, amount invested, amount consumed, amount of depreciation, and change in capital stock. **[10 marks]**
  - What is the amount that the economy will start with in year 5? **[4 marks]**