

**UNIVERSITY OF ESWATINI  
FACULTY OF SOCIAL SCIENCES  
DEPARTMENT OF ECONOMICS**

**RESIT EXAMINATION: JANUARY 2019**

**TITLE OF PAPER: MATHEMATICS FOR ECONOMICS I**

**COURSE CODE: ECO205**

**TIME ALLOWED: 2 HOURS**

**INSTRUCTIONS TO CANDIDATES**

- 1. ANSWER ANY THREE QUESTIONS**

**DO NOT OPEN THIS PAPER UNTIL YOU ARE INSTRUCTED TO DO SO.**

**Question 1**

The equation of a production isoquant is  $25k^{\frac{3}{5}}L^{\frac{2}{5}} = 5400$

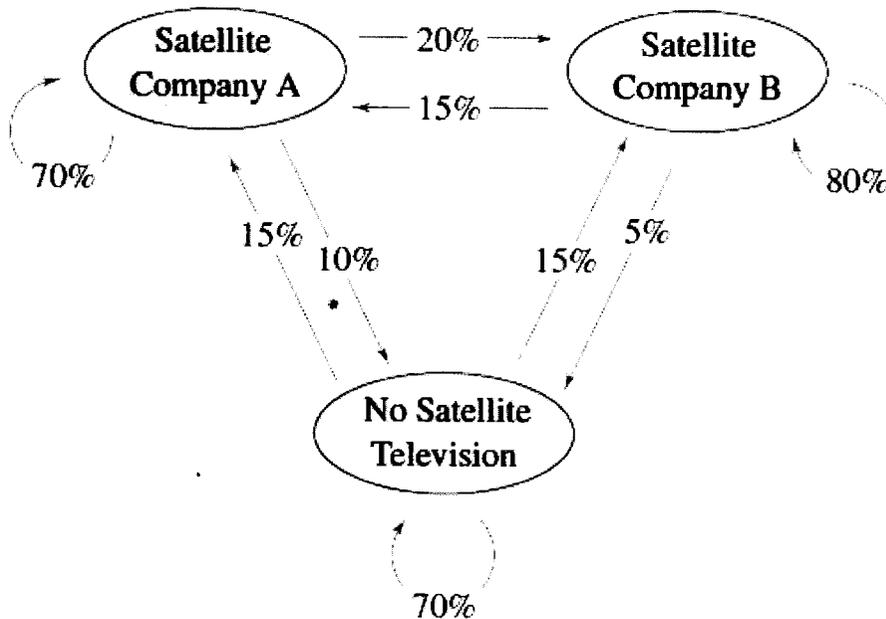
- a) Find the Marginal Rate of Technical Substitution (MRTS or  $\frac{\partial K}{\partial L}$ ) [8]
- b) Evaluate at  $K = 243, L = 181$  [2]
- c) Given the two commodity model as a system of linear equations use Cramers rule to solve for equilibrium prices  $P_1$  and  $P_2$ . [15]

$$c_1P_1 + c_2P_2 = -c_0$$

$$\gamma_1P_1 + \gamma_2P_2 = -\gamma_0$$

**Question 2**

- a) Two competing companies offer satellite television service to a city with 100,000 households. The figure below shows the changes in satellite subscriptions each year. Company A now has 15,000 subscribers and Company B has 20,000 subscribers. How many subscribers will each company have in one year? (Hint find the matrix representing the transition probabilities (P) and the matrix of states of nature (X) and then find the resulting number of subscribers) [10]



- b) The equilibrium condition for three related markets is given by

$$11P_1 - P_2 - P_3 = 31$$

$$-P_1 + 6P_2 - 2P_3 = 26$$

$$-P_1 - 2P_2 + 7P_3 = 24$$

Use gaussian elimination to find the equilibrium price for each market

[15]

**Question 3**

- a) Given  $Y = C + I_o$ , where  $C = C_o + bY$ . Use matrix inversion to find the equilibrium level of  $Y$  and  $C$ . [10]
- b) Faced with two distinct demand functions

$$Q_1 = 24 - 0.2P_1, Q_2 = 10 - 0.05P_2$$

$$\text{The allied } TC = 35 + 40Q$$

- i. What price will the firm charge with discrimination? [10]
- ii. What price will the firm charge without discrimination? [5]

**Question 4**

- a) Use the Jacobian to test for the functional dependence in the following system of equations [5]
- b) For each of the following functions, (1) find the second – order derivative and (2) evaluate it at  $x = 2$ . And (3) using the second derivative test comment on the concavity of each. [20]

- i.  $y = 7x^3 + 5x^2 + 12$
- ii.  $y = x^3 + x^4 + x$
- iii.  $y = x^3 + x^4 + x$
- iv.  $y = (2x + 3)(8x^2 - 6)$