



**NAMIBIA UNIVERSITY  
OF SCIENCE AND TECHNOLOGY**

**FACULTY OF MANAGEMENT SCIENCES**

**DEPARTMENT OF ACCOUNTING, ECONOMICS AND FINANCE**

<b>QUALIFICATION: BACHELOR OF TECHNOLOGY ECONOMICS</b>	
<b>QUALIFICATION CODE: 12BECO</b>	<b>LEVEL: 6</b>
<b>COURSE CODE: MEC212S</b>	<b>COURSE NAME: MATHEMATICAL ECONOMICS</b>
<b>SESSION: JAN 2019</b>	<b>PAPER: THEORY</b>
<b>DURATION: 3 HOURS</b>	<b>MARKS: 100</b>

<b>SUPPLEMENTARY/ SECOND OPPORTUNITY EXAMINATION QUESTION PAPER</b>	
<b>EXAMINER(S)</b>	<b>MR EDEN TATE SHIPANGA</b>
<b>MODERATOR:</b>	<b>PROF T. SUNDE</b>

<b>INSTRUCTIONS</b>
<ol style="list-style-type: none"><li>1. Answer ALL the questions.</li><li>2. Write clearly and neatly.</li><li>3. Number the answers clearly.</li></ol>

**PERMISSIBLE MATERIALS**

1. PEN,
2. PENCIL
3. CALCULATOR

**THIS QUESTION PAPER CONSISTS OF 2 PAGES (Including this front page)**

### Question 1 [25 marks]

Given  $\alpha$  is non-income tax,  $\beta$  is income tax,  $\delta$  is marginal propensity to consume,  $\gamma$  is autonomous consumption,  $Y$  (national income),  $I_0$  (investment) and  $G_0$  (government expenditure), where  $I_0 = 30$ ,  $\gamma = 85$ ,  $\delta = 0.75$ ,  $\beta = 0.2$ , and  $\alpha = 20$ .

1. Formulate four possible equations needed to solve the next question (2.). (12)
2. Find the reduced form of income determination ( $Y_e$ ). (8)
3. Find the numerical value of  $Y_e$ . (5)

### Question 2 [25 Marks]

1. If the total utility function of an individual takes the form of  $U = U(x_1, x_2) = (x_1 + 2)^2(x_2 + 3)^3$  where  $x_1$  and  $x_2$  are the quantities of two commodities consumed:
  - a. Find the marginal-utility function of each of the two commodities. (5)
  - b. Find the value of the marginal utility of both when 3 units of each commodity are consumed? (5)
2. Find the stationary values for the following and check whether relative extremum or inflection point occurs assuming domain in the interval of  $(0, \infty)$ 
  - a)  $y = x^3 - 3x + 5$  (5)
  - b)  $y = (1/3)x^3 - x^2 + x + 10$  (5)
  - c)  $y = -x^3 + 4.5x^2 - 6x + 6$  (5)

### Question 3 [25 Marks]

1. Given the production function  $Q = AK^\alpha L^\beta$ , find the partial derivatives with respect to  $K$  and  $L$  and give their economic interpretation. (10)
2. Given the demand for beef  $Q_b = 4850 - 5P_b + 1.5 P_p + 0.1Y$ , where  $Y = 10\,000$ ,  $P_b = 100$ , and the price for pork  $P_p = 100$ .
  - a) Find the income elasticity of demand for beef? (5)
  - b) Find the cross price elasticity of demand for beef? (5)
  - c) Estimate the  $\Delta\%$  in demand for beef resulting from a 10% increase in the price for pork? (5)

### Question 4 [25 Marks]

Exporters in Namibia export  $Q$  tons of Namibian manufactured products. The selling price in the international market is given by  $P_1 = \alpha - \frac{1}{3}Q$ . The producer price in Namibia is given by  $P_2 = \beta + \frac{1}{6}Q$ . In addition, it costs  $\gamma$  per ton in transport costs.

1. Express the exporters profit as a function of  $Q$ . (5)
2. Find the maximum profit and quantity exported (5)
3. Suppose the Government imposes a export tax of  $t$  per ton exported. Find the new profit maximising quantity AND the profit. (10)
4. Find the export tax rate which maximizes tax revenue. (5)

[Total Marks 100]

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