# MASENO UNIVERSITY

## UNIVERSITY EXAMINATIONS 2015/2016

FIRST YEAR SECOND SEMESTER EXAMINATIONS FOR THE DEGREE OF MASTER OF ARTS IN ECONOMICS

**CITY CAMPUS**

## AEC 803: QUANTITATIVE METHODS

Date: 1st May, 2016 Time: 2.00 - 5.00 pm

## INSTRUCTIONS:

- Answer ANY FOUR questions.

## QUESTION ONE

a) Discuss clearly the roles played by quantitative approach to managerial decision making (5 marks)

b) Using simplex method, solve the following Linear Programming problem and interpret the solutions

Maximize $\Pi = 2x_1 + 12x_2 + 8x_3$

Subject to the constraints

$$2x_1 + 2x_2 + x_3 \leq 100,$$
$$x_1 - 2x_2 + 5x_3 \leq 80$$
$$10x_1 + 5x_2 + 4x_3 \leq 300,$$
$$x_1, x_2, x_3 \geq 0$$

(10 marks)

## QUESTION TWO

a) Discuss the applications of Markov chain analysis in Business (4 marks)

b) Explain the fundamental assumptions of Markov chain analysis (4 marks)

c) On Jan 1, 2009, Klosman Firm held 40% of its total market and two other firms Abeingo and Buda held 40% and 20% respectively. Based on a study conducted by a marketing research firm, the following facts were compiled;

- Klosman retains 90% while gaining 5% of competitor Abeingo's customers and 10% of Buda's customers.
- Abeingo retains 85% of its customers, gains 5% of Klosman's customers and 7% of Buda's customers.
- Buda retains 83% of its customers, gains 5% of Klosman's customers and 10% of Abeingo's customers.

Required:

i). Determine each firm's market share on Jan 1, 2011? (3marks)

ii). Determine each firm's market share at equilibrium? (4 marks)

## QUESTION THREE

Sales of 21-Inch Color Television sets and three-Month lagged unemployment are shown in the following table.

| Period | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Units Sold (y) | 20 | 41 | 17 | 35 | 25 | 31 | 38 | 50 | 15 | 19 | 14 |
| Unemployment % (3 month lag) (x) | 7.2 | 4.0 | 7.3 | 5.5 | 6.8 | 6.0 | 5.4 | 3.6 | 8.4 | 7.0 | 9.0 |

a) Calculate the correlation between the unemployment levels and the demand for the 21-inch TVs (3 marks)

b) Derive a predictive equation for the units of TV sets sold and the unemployment level (5 marks)

c) What percentage of the variations in the units sold is explained by the unemployment levels in the equation formulated in (b) above? (3 marks)

d) Explain the assumptions of the technique used in (b) above (4 marks)

## QUESTION FOUR

a) HENA Company limited has been faced with the decision alternatives of either to Expand, Build or Subcontract its operations. The table below represents the pay offs for the company at various states of nature.

| | | *Decision makers alternatives* | | |
|---|---|---|---|---|
| | | Expand | Build | Subcontract |
| *State of Nature (Demand)* | High | 500 000 | 700 000 | 300 000 |
| | Moderate | 250 000 | 300 000 | 150 000 |
| | Low | -250 000 | -400 000 | -10 000 |
| | Failure | -450 000 | -800 000 | -100 000 |

Advise using the decision alternative what the company can do under

i). The Minimax Regret Criterion (4 marks)

ii). Suppose you feel fairly optimistic and assign $\alpha$ a value of 0.7, advise the company on the realism criterion. (4 marks)

iii). Using the expected value criterion identify the best alternative given the following probabilities: High= 0.2, Moderate= 0.4, Low=0.3, Failure= 0.1 (4 marks)

b) Explain the following terms as used in decision analysis

i) Risk ii) Uncertainty iii) States of nature (3 marks)

## QUESTION FIVE

a) State and explain the major limitations of input-output models (4 marks)

b) An economy has three industries; Coal, Electricity and Railways.To produce Ksh 1 of Coal requires ksh 0.25 worth of electricity and Ksh 0.25 rail cost of transportation; to produce ksh 1 of electricity requires Ksh 0.65 worth of coal for fuel, ksh 0.05 of electricity for auxiliary equipment and ksh 0.05 for transportation; to provide ksh 1 worthy of transport, the railways requires ksh 0.55 coal for fuel and ksh 0.10 of electricity. Each week the external demand for coal is ksh 50,000 and for electricity is ksh 25,000.There is no external demand for railway. What should be the weekly production schedule for each industry. (11 marks)

## QUESTION SIX

a) Minimize a firm's total cost $C = 45x^2 + 90xy + 90y^2$ when the firm has to meet a production quota equal to $2x + 3y = 60$

i). Find the critical values

ii). Using the bordered Hessian test the second order condition. (7 marks)

b) Discuss the limitations of calculus in decision making. (4 marks)

c) Using examples, discuss the applications of calculus in business decision making (4 marks)