JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF BUSINESS & ECONOMICS

UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR OF BUSINESS ADMINISTRATION (BBA With IT) FOR

SECOND YEAR SEMESTER ONE ACADEMIC YEAR 2018/2019

KISUMU CAMPUS – PART-TIME

COURSE CODE: ABA 205

COURSE TITLE: MANAGEMENT MATHEMATICS II

EXAM VENUE:

DATE: 13/08/19 **EXAM SESSION: 2.00 – 4.00PM**

DURATION: 2 HOURS

INSTRUCTIONS

1. **Answer QUESTION ONE and any other TWO questions**
2. **Candidates are advised not to write on the question paper**
3. **Candidates must hand in their answer booklets to the invigilator while in the examination room.**

QUESTION ONE (30 MARKS) - COMPULSORY

(a) What is the limit of y = 3 + $(½)^x$ as x increases without limit? (4 Marks)

(b) Obtain the derivative of the following function from first principles

$y = 4x2 - x + 3$

and hence calculate the slope when x = 11 (5 Marks)

(c) Highlight the assumptions of linear programming models. (8 Marks)

(d) Solve the linear programming problem. Sketch the feasible region and find the maximum value points on the graph.

Maximise $5x + 3y$

subject to

$2x + 4y \leq 8$

$x \geq 0$

$y \geq 0$ (4 Marks)

(e) Mathematically explain the properties of matrix operation in comparison to ordinary arithmetic. (4 Marks)

(f) Two matrices A and B are given by

$$A = \begin{bmatrix} a-b & b \\ a+b & 3c-b \end{bmatrix} \text{and} B = \begin{bmatrix} 1 & 3a \\ 2c & d+1 \end{bmatrix}$$

If A = B find the values of a, b, c and d. (5 Marks)

QUESTION TWO (20 MARKS)

(a) Find the inverse of the matrix

$$\begin{bmatrix} 3 & -2 \\ -1 & 9 \end{bmatrix}$$ (4 Marks)

(b) The demand and supply functions for two interdependent commodities are given by

$Q_{D1} = 100 - 2P_1 + P_2$

$Q_{D2} = 5 + 2P_1 - 3P_2$

$Q_{S1} = -10 + P_1$

$Q_{S2} = -5 + 6P_2$

Where Q_{Di},Q_{Si} and $P_i$denote the quantity demanded, quantity supplied and price ofgood i respectively.

Required:

(i) Show that the equilibrium prices satisfy the simultaneous equations

$3P_1 - P_2 = 110$

$-2P_1 + 9P_2 = 10$ (6 Marks)

(ii) Use your answer to part (a) to find the equilibrium prices. (4 Marks)

(c) Consider the two-sector macroeconomic model

$Y = C + I^*$
$C = aY + b$

(i) Express this system in the form Ax = b

Where x = $\begin{bmatrix} Y \\ C \end{bmatrix}$ and A and b are 2 × 2 and 2 × 1 matrices to be stated. (3 Marks)

(ii) Use Cramer's rule to solve this system for C. (3 Marks)

QUESTION THREE (20 MARKS)

(a) Explain the following terms as applied in linear programming:

- (i) Slack variable (2 marks)
- (ii) Surplus variable (2 Marks)
- (iii) Infeasibility (2 Marks)

(b) An insurance company employs full- and part-time staff, who work 40 and 20 hours per week, respectively. Full-time staff are paid Sh.80,000 per week and part-time staff Sh.32,000. In addition, it is company policy that the number of part-time staff should not exceed one-third of the number of full-time staff.

If the number of worker-hours per week required to deal with the company's work is 900, how many workers of each type should be employed in order to complete the workload at minimum cost? (14 Marks)

QUESTION FOUR (20 MARKS)

(a) A firm's marginal cost function is

$MC = Q^2 + 2Q + 4$

Find the total cost function if the fixed costs are Sh.10,000. (4 Marks)

(b) A principal of Sh.400,000 is invested at an annual interest rate of 6%, and the future value of this investment t years later is $S(t)$, which satisfies

$$\frac{dS}{dt} = 0.06S$$

- (i) Solve this equation to express S in terms of t. (4 Marks)
- (ii) What type of compounding is represented by this model? (2 Marks)

(c) Consider the two-sector macroeconomic model

$$\frac{dY}{dt} = 0.2(C + I - Y)$$

$$C = 0.8Y + 420$$

$$I = 300$$

Required:

(i) Find an expression for $Y(t)$ when $Y(0)$ = Sh.8000. (4 Marks)

(ii) Hence, find an expression for the savings function, $S(t)$. (2 Marks)

(iii) Find the time taken for income to fall to Sh.4150 and find the rate of change of incomeat this time. Give your answers to the nearest whole number. (4 Marks)

QUESTION FIVE (20 MARKS)

Explain the meaning of the following term as applies in Markov Process:

(i) Transition probability (1 Mark)

(ii) State probability (1 Mark)

(iii) Steady-state probability (1 Mark)

(iv) Absorbing state (1 Mark)

Management of the New VictoriaSoftdrink Company believes that the probability of a customerpurchasing Red Pop or the company's major competition, Super Cola, is based onthe customer's most recent purchase. Suppose that the following transition probabilitiesare appropriate:

	To	
From	Red Pop	Super Cola
Red Pop	0.9	0.1
Super Cola	0.1	0.9

Required:

(i) Show the two-period tree diagram for a customer who last purchased Red Pop. Whatis the probability that this customer purchases Red Pop on the second purchase? (5 Marks)

(ii) What is the long-run market share for each of these two products? (6 Marks)

(iii) A Red Pop advertising campaign is being planned to increase the probability ofattracting Super Cola customers. Management believes that the new campaign willincrease to 0.15 the probability of a customer switching from Super Cola to Red Pop.What is the projected effect of the advertising campaign on the market shares? (5 Marks)

END