PWANI UNIVERSITY COLLEGE

A CONSTITUENT COLLEGE OF KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2008/2009 ACADEMIC YEAR

1ST YEAR 1ST SEMESTER EXAMINATION FOR THE DEGREE OF

STREAM: BACHELOR OF COMMERCE

CMS 100: MANAGEMENT MATHEMATICS

END SEMESTER:I **TIME: 3 HOURS**

DAY/TIME: TUESDAY: 5.00 – 7.00 P.M. **DATE: 25/11/2008**

INSTRUCTIONS

- *Answer question ONE and any other THREE questions*
- *Marks are indicated in brackets ( )*

QUESTION ONE - (40 MARKS)

a) Briefly explain the following terms:

i) Multivariate function (2 mks)

ii) Continuity of a function (2 mks)

iii) Differential calculus (2 mks)

iv) Set intersection (2 mks)

b) Pwani University Acconting Students Association operates a Kiosk where it sells printed T-shirts. The demand function for the shirts is

$Q_D = 150 – 10 P$

Where P is the price in dollars per unit and Q_D is the quantity demanded in units per period. Determine the number of shirts to be sold to maximize total revenue. Hence, find the price when total revenue is maximized. (4 mks)

c) Differentiate the following:-

i) $y = -4x^2 – 5x + 8 – \frac{3}{x}$ (2 mks)

ii) $y = \frac{4x^{1/2}}{5 + 5x^2}$ (3 mks)

iii) $f(x) = 5^{2x}$ (2 mks)

d) Determine the partial derivatives w.r.t. all the variables in the function given

$$QA = 2.5 P_A^{-1.30} Y^{0.20} P_B^{0.40} + P_B^{0.20}$$ (4mks)

e) Suppose the revenue from selling x custom made office desks is

$$r(x) = 200 \left[1 - \frac{1}{x+1} \right] \text{ dollars}$$

i) Find the marginal revenue when x desks are produced.

ii) Use the function r'(x) to estimate the increase in revenue that will result from increasing production from 5 desks to 6 desks a week. (5 mks)

f) Evaluate the following limits

i) $\lim_{x \to \frac{3}{2}} \sqrt{10}$ (1 mk)

ii) $\lim_{x \to 9} \frac{x - 9}{\sqrt{x} - 3}$ (2 mks)

g) The function describing the marginal cost of producing a product is
MC = x + 100
Where x equals the number of units produced. It is also known that total cost equals sh.40,000
When x = 100. Determine the total cost function (3 mks)

h) Evaluate $\int_1^4 (5x - 2\sqrt{x} + \frac{32}{x^3})\, dx$ (3 mks)

i) Give 3 limitations of the graphical method in solving linear programming model (3 mks)

QUESTION TWO - (10 MARKS)

a) Consider a monopolist firm with 2 products A and B. The demand functions for the two products are:

$P_A + q_A = 80$ and $P_B + 2q_B = 50$

Where P is the price and q is quantity sold. The total cost function is:-

$TC = 100 + 8q_A + 6q_B + 14q_A^2 + 4q_B + 4q_Aq_B$

$TR_A = 80q_A – q_A^2$ and $TR_B = 50q_B – 2q_B^2$

The form wishes to max total profits.

Required:

i) Derive the total profit function

ii) Determine the quantities q_A and q_B that gives maximum profits.

iii) Determine the prices P_A and P_B that yields this maximum profits (8 mks)

b) Given the following Dual L.P model, convert it into a primal L.P model

Max $B_o = 600y_1 + 180y_2 + 215y_3$

Subject to: $3y_1 + 12y_2 + 5y_3 \le 56$
$4y_1 + y_2 + 7y_3 \le 90$
$y_1, y_2, y_3 \ge o$ (2 mks)

QUESTION THREE- (10 MARKS)

Makuti Villa Company Ltd estimates that the cost (in dollars) of producing x units of a certain commodity is given by

$C(x) = 200 + 0.05x + 0.0001x^2$

Required:

a) Find the cost, average cost and marginal cost of producing

i) 500 units
ii) 1000 units
iii) 5000 units (5 mks)

b) Find the number of units which will minimize the average cost

(3 mks)

c) Fin d the minimum average cost. (2 mks)

QUESTION FOUR -(10 MARKS)

The demand for x units of a certain commodity is related to a selling prices dollars per unit by means of the equation $2x + s^2 – 12000 = 0$

Required:

i) Find the demand function, the marginal demand function, the total revenue function and the marginal revenue function.

ii) Find the number of units and the price per unit which yield the maximum revenue. What is this maximum revenue?

QUESTION FIVE - (10 MARKS)

A manufacturer of cooking fat produces 2 types of cooking fat normal and soft requiring the same input inputs into the production process are man hours, machine hours and raw materials. Each unit of the soft cooking fat requires 4 units of man hours, 12 units of machine hours and 8 units of raw materials. On the other hand 1 unit of normal cooking fat requires 8 units of man hours, 4 units of machine hours and 8 units of raw materials. During each week there are 320 units of man hours and 400 units of raw materials. Given that each unit of soft cooking fat contribute 18/= towards total profit and each unit of the normal cooking fat contribute 12/= towards total profit.

Required:

i) Formulate this problem as a L.P model (2 mks)

ii) Using the simplex method determine the amount of each type of cooking fat to be produced for profit maximization (8 mks)