



**KABARAK**

**UNIVERSITY**

**UNIVERSITY EXAMINATIONS**

**2008/2009 ACADEMIC YEAR**

**FOR THE DEGREE OF BACHELOR OF COMMERCE**

**COURSE CODE: FNCE 120**

**COURSE TITLE: MANAGEMENT MATHEMATICS I**

**STREAM: Y1S2**

**DAY: THURSDAY**

**TIME: 2.00 – 4.00 P.M.**

**DATE: 7/8/2008**

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**INSTRUCTIONS:**

1. Answer **Question ONE** and any other **two** questions
2. Show your workings clearly
3. Begin each question on each page.

**PLEASE TURN OVER**

**QUESTION ONE (30 MARKS)**

(a) Solve the following for x

(i)  $\frac{7x+3}{2} - \frac{9x-8}{4} = 6$  (4mks)

(ii)  $x^2 + x - 12 = 0$  (3mks)

(b) Expand  $(1 + 2x)^{16}$  up to the term  $x^3$  and hence evaluate  $(0.96)^{16}$  and  $(1.04)^{16}$  (5mks)

(c) A company produces a product for which the variable cost per unit is Kshs.6 and fixed cost is Kshs.80,000. Each unit has a selling price of Kshs.10. Determine the number of units that must be sold for the company to earn a profit of Kshs.60,000. (4mks)

(d) Differentiate  $Y = (x^2 + 3x)(4x + 5)$ , When  $x = 1$  (4mks)

(e) Evaluate;  $\int_{-2}^1 x^3 dx$  (4mks)

(f) Solve the following for x

$$2\log_a x - \log_a(x - 1) = \log_a(x - 2) \quad (4mks)$$

(g) Solve;  $3 - 2x \leq 6$  (2mks)

**QUESTION TWO (20 MARKS)**

(a) Consumer survey was conducted to determine the demand function for a particular product. The demand function was found to be

$$q = f(P) = 400,000 - 1000p$$

Where q is stated in units and P is stated in Kshs.

(i) Determine the quadratic total revenue function, where  $R = g(P)$  i.e. R is a function of P. (3mks)

(ii) What is the concavity of the function? (6mks)

(iii) What is P intercept? (6mks)

(iv) What does total revenue equals at a price of Kshs.50 (3mks)

(v) How many units will be determined at this price? **(3mks)**

(vi) At what price will total revenue be maximized **(3mks)**

**QUESTION THREE (20 MARKS)**

(a) Examine the following function for any critical points and determine their nature.

$$f(x) = -x^5 \quad \textbf{(6mks)}$$

(b) An electric company has proposed building a nuclear power plant on the outskirts of a major metropolitan area. As might be expected, public opinion is divided and discussions have been heated. One lobbyist group opposing the construction of the plant has presented some disputed data regarding the consequences of a catastrophic accident at the proposed plant. The lobbyist group estimates that the rate which death would occur within the metropolitan area because of radioactive fallout is described by the function.

$$r(t) = 200,000e^{-0.1t}$$

Where  $r(t)$  represent the rate of deaths in persons per day and  $t$  represents time elapsed since the accident measured in days. The population of the metropolitan area is 1.5 million persons.

(i) Determine the expected number of deaths 1 day after a major accident. **(7mks)**

(ii) How long would it take for all people in the metropolitan area to succumb to the effects of the radioactivity? **(7mks)**

**QUESTION FOUR (20 MARKS)**

(a) A company manufactures two types of skis, the lightning and the Alpine models. Suppose the joint-cost function for producing  $x$  pairs of the lightning model and  $y$  pairs of the Alpine model per week is

$$C = f(x,y) = 0.07x^2 + 75x + 8y + 6000$$

Where  $C$  is expressed in Kshs. Determine the marginal cost  $\partial c / \partial x$  and  $\partial c / \partial y$  when  $x = 100$  and  $y = 50$  and interpret the results. **(6mks)**

(b) Solve the following for  $x$

(i)  $\log_{10}(x^2 - 6) = 1 + \log_{10}(x - 3)$  **(4mks)**

- (ii)  $x^2 + 4x - 21 = 0$  **(4mks)**
- (c) Sketch the quadratic function

$$f(x) = 3x^2 + 6x - 45 \quad \textbf{(6mks)}$$

**QUESTION FIVE (20 MARKS)**

- (a) Examine the following function for any critical point and determine its nature

$$\text{Maximize } f(x_1, x_2) = 25 - x_1^2 - x_2^2$$

$$\text{Subject to } 2x_1 + x_2 = 4$$

**(15mks)**

- (b) Solve the following by substitution method

$$\int (x + 6)^{12} dx$$

**(5mks)**