KABARAK   **UNIVERSITY**

UNIVERSITY EXAMINATIONS

2009/2010 ACADEMIC YEAR

FOR THE DEGREE OF BACHELOR OF COMMERCE

COURSE CODE: FNCE 120

COURSE TITLE: MANAGEMENT MATHEMATICS I

STREAM: **Y1S2**

DAY: **TUESDAY**

TIME: **3.00 – 5.00 P.M.**

DATE: **06/04/2010**

INSTRUCTIONS:

- Answer question ONE and any other THREE questions
- Begin each question on a separate page
- Show your workings clearly

PLEASE TURNOVER

QUESTION ONE (30 MARKS)

a) What do you understand by the following
    i)   Marginal Revenue   (2 marks)
    ii)   Marginal Cost   (2 marks)
    iii)   Marginal Profit   (2 marks)
    iv)   Extrema   (2 marks)

b) Explain the use of first derivative test to test for the critical points and their nature
                                                                     (5 marks)

c) A firm has the revenue function $R = 100q - q^2$ and the cost $T = q^3 - \dfrac{57}{2}q^2$. Find the

   maximum profit   (5 marks)

d) $\int (x+6)^6 \, dx$ (4 marks)

e) A Survey in a town showed that 20,000 people were Christians and 8,000 people were Muslims. There are 4,000 people who were Christians and Muslims. Given the above information:
    i)   How many people are Christians but not Muslims   (3 marks)
    ii)   How many people are muslims but not Christians   (3 marks)
    iii)   How many people are either Christians or Muslims   (2 marks)

QUESTION TWO (20 MARKS)

a) A Major distributor of Sodas is thriving. One of the distributors major problems are keeping up with the demand for sodas. The annual cost of purchasing, owning and maintaining the inventory of sodas is described by the function

   C = 280,000/q + 0.15q + 200,000

   Where q equals the order size (in dozens of sodas) and C equals the annual inventory cost

      i)   Determine the order size q which minimizes annual inventory cost (5 marks)
      ii)   What are the minimum inventory costs expected to equal   (3 marks)

b) Explain how to transform a constraint optimization problem into uncostraint optimization problem   (6 marks)

c) The function describing the marginal cost (in dollars) of producing and selling a product is
         MC = 8x + 800
   Where x equals the number of units produced. It is known that the total cost equals $80,000 when 40 units are produced. Determine the total cost function   (6 marks)

QUESTION THREE (20 MARKS)

i)   If the supply function for a good is $x = S(p) = p - 10$ and the demand function is
    $x = D(p) = 20 - p/2$, what are the equilibrium price and quantity   (4 marks)

ii) If a monopolist takes over this market what are his total and average revenues
    expressed as a function of quantity sold   (5 marks)

iii) The monopolist takes over all the plants in the industry so that his marginal cost
    function is the same as the old supply relation when his relation is expressed as a
    function of x. How much will he produce for maximum profit and what price will he
    charge   (7 marks)

iv) Monopolist introduces more efficient plants so that his marginal cost function changes
    to $dc/dx = 11 + x/4$. How much will he, now produce and what price will he change
                                                                             (4 marks)

QUESTION FOUR (20 MARKS)

a) Two points on a linear demand functions are (20, 80,000) and (30, 62500)
    i)   Determine the demand function $q = f(p)$ (4 marks)
    ii) Determine what price would result in demand of 50,000 units   (2 marks)
    iii) Interpret the slope of the function   (2 marks)
    iv) Sketch the function $q = f(p)$ (2 marks)

b) A firm estimates that the number of units it sells each year is a function of the advertising
   expenditures for TV and Radio. The function expressing this relationship is

   $$Z = 2000x + 5000y - 20x^2 - 10y^2 - 50xy$$

Where z equals the number of units sold, x equals the amount spent on TV advertising, and y
equals the amount spent on radio advertising (expressed in $1000s). The firm is presently
allocating $50,000 to TV and $30,000 to radio.

a) What are annual sales expected to equal   (2 marks)
b) Using partial derivatives, estimate the effect on annual sales if additional $1000 is
   allocated to TV   (3 marks)
c) Using partial derivatives, estimate the effect on annual sales if additional $1000 is
   allocated to Radio   (3 marks)
d) Where it seem that the $1000 is better spent   (2 marks)

QUESTION FIVE (20 MARKS)

A State civic organization is conducting its annual fund-raising campaign for the disadvantaged. The campaign expentitures will be incurred at a rate of 10,000 per day. From past experience it is known that contributions will be high during the early stages of the campaign and will tend to fall off as the campaign continues. The function describing the rate of contributions are received is

$$C(t) = -200t^2 + 40,000$$

Where t represents the day of the campaign and C (t) equals the rate at which contributions are received, measured in dollars per day. The organization wish to maximize the net proceeds from the campaign

a) Determine how long the campaign should be conducted in order to maximize net proceeds   (4 marks)
b) What are the total campaign expenditures expected to equal   (2 marks)
c) What are the total contributions expected to equal   (5 marks)
d) What are the net proceeds (total contributions less total expenditures) expected to equal   (2 marks)
a) Briefly explain the rate of change in Business and Economics and its applications   (8 marks)