

**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: 2:00 – 4:00P.M.**

**DATE: 23/03/2010**

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**INSTRUCTIONS:**

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

**PLEASE TURNOVER**

### QUESTION ONE (30 MARKS)

- a) Briefly describe Break-even analysis ( 5 marks)
- b) Interpret **a** and **b** in the following equation  $Y = ax + b$  as a salary function and as a Total cost function ( 4 marks)
- c) Solve the following for x  $\text{Log}_2(x + 5) + \text{Log}_2(x + 2) = \text{Log}_2(x + 6)$   
( 4 marks)
- d) A Survey in a town showed that 10,000 people were Smokers and 4,000 people drunkards. There are 2,000 people who smoked and drank. Given the above information:
- How many people smoke but do not drink ( 2 marks)
  - How many people drink but do not smoke( 2 marks)
  - How many people either smoke or drink( 2 marks)
- e) The total cost and total revenue functions for a product are
- $$C(q) = 500 + 100q + 0.5q^2$$
- $$R(q) = 500q$$
- Using the marginal approach, determine the profit- maximizing level of output  
( 4)
  - What is the maximum profit( 2 marks)
- f) What do you understand by the following terms
- Extrema (1 marks)
  - Critical value and critical point(2 marks)
  - Relative maximum and Absolute maximum(2 marks)

### QUESTION TWO (20 MARKS)

- a) An electric company has proposed building a nuclear power plant on the outskirts of a major metropolitan area. The company estimates that the rate at which deaths would occur within the metropolitan area because of radioactive fallout is described by the function

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

Where  $r(t)$  represents 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.

- Determine the expected number of deaths 1 day after a major Accident (5 marks)
- How long would it take for all people in the metropolitan area succumb to the effects of the radioactivity (5 marks)

- b) The demand equations for two market segments and the firms cost function are given below:

$$P_1 = 17 - 2Q_1 \text{ (Demand equation for the first segment)}$$

$$P_2 = 25 - 3Q_2 \text{ (Demand equation for the second segment)}$$

$$C = 2 + Q_1 + Q_2 \text{ (Cost function)}$$

If the firms objective is to maximize profits, determine the prices it should charge in the first and the second segments (10 marks)

### **QUESTION THREE (20 MARKS)**

- a) A businessman conducted a survey to determine the demand function for a product. Consumers were asked questions if they would purchase the product at various price and from their responses constructed estimates of market demand at various market prices. After sample data points were plotted, it was concluded that the demand relationship was estimated best by a Quadratic function. Researchers concluded that the quadratic representative was valid for prices between 5 and 45.

Three data points chosen for fitting the curve were (5, 2025), (10, 1600) and (20, 900).

Determine the Quadratic demand function and sketch the curve. (14 marks)

- b) The profits of a company are given by the following equation:

$$\text{Profit (Z)} = -56,000 + 1200P - 4P^2$$

where P is the price of a product. Calculate the price at which the profit is zero (6 marks)

### **QUESTION FOUR (20 MARKS)**

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

$$f(x) = -10,000e^{-0.03x} - 120x + 10,000 \quad (12 \text{ marks})$$

- b) Describe clearly rate of change in Business and Economics (8 marks)

**QUESTION FIVE (20 MARKS)**

- a) Determine the break-even quantity of XYZ manufacturing Co. given the following data: Total cost ksh 2400; Variable cost per unit ksh 4; Total revenue for selling  $q$  units  $y_{TR} = 200\sqrt{q}$  (5 marks)
- b) The supply and demand function for a product are  $q_s = p^2 - 100$  and  $q_d = p^2 - 10p + 1100$ . Determine the market equilibrium price and the quantity (5 marks)
- c) If a manufacturer's average-cost equation is  $\bar{c} = 0.0001q^2 - 0.02q + 5 + \frac{500}{q}$ .
- i) Find the marginal-cost function (6 marks)
  - ii) What is the marginal cost when 50 units are produced (4 marks)