# Department of Management

# College of Business and Economics

# Mekelle University

# Mathematics for Management worksheet

## CHAPTER ONE

1. If taxi fare is 1 birr plus 20 cents per quarter mile, write the equation relating fares to number of miles travelled.
2. What is the slope of $2x+4y = 8$
3. Below is a table revealing the three product divisions of Akaki Steel Processing along with their prices and variable costs.

| | Product type | | |
|---|---|---|---|
| | A | B | C |
| Selling price/u | Birr 40 | Birr 30 | Birr 20 |
| Variable cost/u | Birr20 | Birr 16 | Birr 12 |

It has been studied that each production division involves a separable fixed cost of birr110, 000; birr 60,000, and birr 40,000 respectively. Moreover, it has been budgeted that common fixed costs amounted to birr 200,000 with an allocation rates of 5, 3 and 2. Find the break-even quantities for each of the production divisions.

4. A company's cost function for three months is given as: TC= 12Q+80,000
   a. Find BEQ if the company's product sells for 16 birr per unit.
   b. If b/c of strike the co. will be able to produce only 10,000 units. Should it shut down its operation? Why or why not?
   c. If b/c of loss of demand, the co. is forced to sell its product (the 10000 units) at birr 10. Should it shut down its operation? Why or why not?
   d. If the co. expected a profit of 20,000, what will be its production volume?
   e. At what volume of production will the co. incurs a loss of 5000 birr?
5. Given TC= 5Q+500,000 and selling price 5.5 per unit.
   a. Find breakeven quantity and breakeven sales
   b. If b/c of short of row material, the most the co. can produce is 100,000 units. Should it shut down? Why?

6. A retail co. plans to work on a margin of 44% of retail price & to incur other Variable Cost of 4%. If it expected fixed cost of Br. 20,000.
   a. Find the equation relating Total Cost to sales
   b. Find the profit if sales are Br. 60,000
   c. Find the breakeven revenue
   d. If profit is Br. 15,000 what should be the revenue level?
   e. If you have any one item at a price of Br. 15/unit how do you convert the cost equation in terms of revenue in to a cost equation in terms of quantity

**CHAPTER TWO**

1. MIE produces two types of product *model M-01* and *M-02*. Each unit of M-01 requires 2 kg of raw material and 4 labour hours for processing while each unit of M-02 required 3 kg of raw material and 3 hrs of labour. Every week, the firm has 60 kg of raw material and 96 labour hrs available. How many units of *M-01* and *M-02* can be produced if MIE fully utilized the available resource? **(Use estimation or Gauss Jordan Method).**
2. Desta's manufacturer produces two products P & Q. Each unit of product P requires (in its production) 20 units of row material A & 10 units of row material B. each unit of product Q requires 30 units of raw material A & 50 units of raw material B. there is a limited supply of 1200 units of raw material A & 950 units of raw material B. How many units of P & Q can be produced if Desta want to exhaust the supply of raw materials? **(Use Estimation, Gauss Jordan, or Inverse method)**
3. The market share of two restaurants, namely A and B is given as 60% and 40% respectively. The restaurants are campaigning on their **super Saturday** business. A survey indicates that of those who ate their Saturday meal at A, 70% will return next Saturday and 30% switch to B. Moreover, of those who had their meal in B, 60% will come again next Saturday and 40% will switch to A.
   a. What will be the proportion of market shares next Saturday
   b. What is the steady state
4. Assume that a market is shared by two brands of cigarette namely Rothman and Nyala. The study conducted has concluded the following information about the proportion of users who stay in the same or changes brand in consecutive weeks. From a sample

conducted on 1000 users, 400 (40%) users bought Rothman and 600 (60%) bought Nyala in the first week of the observation.

- Of the users who smoke Rothman last week, 50% buy it again, and 50% change to Nyala in the second week.
- Of the users who smoke Nyala last week, 40% buy it again and 60% change to Rothman in the second week.

a. Formulate the transition matrix
b. What is the expected proportion of users for the 2nd, and 3rd weeks?
c. What will be the steady state?

## CHAPTER THREE

1. Given the following linear programming model;

***Minimize cost= 50 $x_1$ + 40 $x_2$***

***Subjected to:*** $6x_1 + 4x_2 \geq 24$

$x_1 + 2x_2 \geq 6$

$x_1, x_2 \geq 0$

Required:

a) ***Draw the graph*** of the problem& identify the ***feasible solutions***
b) Determine the values of ***$x_1$, $x_2$ and the minimum cost***.

**2. Max Profit =300$X_1$ +250$X_2$**

Subject to:

$2X_1 + X_2 \leq 40$

$X_1 + 3X_2 \leq 45$

$X_1, X_2 \geq 0$

$$Max.profit = 50X_1 + 80X_2$$
$$subjectto$$
$$X_1 + 2X_2 \leq 32$$
$$X_1 + 4X_2 \leq 82$$
$$X_1, X_2 \geq 0$$

## Chapter four: Mathematics of finance

1. Given

P= 1000

Simple interest rate = 5%

Time = 5 years

Find a) Interest

b) Amount

2. Find the Interest on Br. 5, 000 at 10% for 45 days.
3. How much should be deposited in an account paying 10% compounded quarterly in order to have an Amount of Br. 10, 000 after ten years?
4. What is the present value of a loan that will amount to Br. 5, 000 in 5 years if money is worth 3% compounded semi-annually?
5. If 100Br is deposited in an account at the end of every quarter for the next five years, how much will be in the account at the time of the final deposit if interest is 8% compounded quarterly?
6. How much should be deposited in a sinking fund at the end of each quarter for five years to accumulate $100,000 if the fund earns 8% compounded quarterly?
7. A company has borrowed 50,000 Br. at 10% compounded quarterly. The debt is to be amortized by equal payments each quarter over 15 years.
    **a.** Find the quarterly payment.
    **b.** How much interest will be paid?