

# Admas University

## School of Post graduate studies

### Quantitative Analysis for Decision Making Group Assignment One - 30%

**Instruction:** Clearly show the steps required to arrive at your final solutions.

1. A company manufactures two products  $X_1$  and  $X_2$  on three machines  $A$ ,  $B$ , and  $C$ .  $X_1$  require 1 hour on machine  $A$  and 1 hour on machine  $B$  and yields a revenue of **Br.3/-**. Product  $X_2$  requires 2 hours on machine  $A$  and 1 hour on machine  $B$  and 1 hour on machine  $C$  and yields revenue of **Br. 5/-**. In the coming planning period the available time of three machines  $A$ ,  $B$ , and  $C$  are 2000 hours, 1500 hours and 600 hours respectively. **Formulate a model that helps to find the optimal product mix.**
2. Dorian makes luxury cars and jeeps for high-income men and women. It wishes to advertise with 1 minute spots in comedy shows and football games. Each comedy spot costs \$50K and is seen by 7M high-income women and 2M high-income men. Each football spot costs \$100K and is seen by 2M high-income women and 12M high-income men. How can Dorian reach 28M high-income women and 24M high-income men at the least cost? **Formulate the model that helps to solve the problem.**
3. A factory manufactures two products  $A$  and  $B$  on three machines  $X$ ,  $Y$ , and  $Z$ . Product  $A$  requires 10 hours of machine  $X$  and 5 hours of machine  $Y$  and one hour of machine  $Z$ . The requirement of product  $B$  is 6 hours, 10 hours and 2 hours of machine  $X$ ,  $Y$  and  $Z$  respectively. The profit contribution of products  $A$  and  $B$  is **Br. 23/-** per unit and **Br. 32/-** per unit respectively. In the coming planning period the available capacity of machines  $X$ ,  $Y$  and  $Z$  are 2500 hours, 2000 hours and 500 hours respectively. **Formulate a model that helps to find the optimal product mix for maximizing the profit.**

4. Solve the following model using graphical method

$$\text{Min } z = 50x_1 + 100x_2$$

s.t.

$$7x_1 + 2x_2 \geq 28$$

$$2x_1 + 12x_2 \geq 24$$

$$x_1, x_2 \geq 0$$

5. Given the following model:

$$\text{Maximize } Z = 15x_1 + 45x_2$$

s.t.

$$1x_1 + 16x_2 \leq 240$$

$$5x_1 + 2x_2 \leq 162$$

$$0x_1 + 1x_2 \leq 50$$

$$x_1, x_2 \geq 0$$

**Required:**

- A. Find the optimum solution to the problem using simplex method
- B. If  $Z_{\max}$  and  $c_2$  is kept constant at 45, find how much  $c_1$  can be changed without affecting then optimal solution. (Hint: find the range of optimality for coefficient of objective function.)