

# Department of Computer Applications

## Optimization Problem – Exercise sheet

1. A firm manufactures two products A and B on which the profit earned per unit are Rs. 3 and Rs. 4 respectively. Each product is processed on two machines M 1 and M 2. Product A requires one minute of processing time on M 1 and two minutes on M 2 while B requires one minute on M 1 and one minute on M 2. Machine M 1 is available for not more than 7 hours 30 minutes, while machine M 2 is available for 10 hrs during any working day. Find the number of units of products A and B to manufacture to get maximum profit.

2. Use graphical to solve the following LP problems.

A) Maximize  $z = 6x_1 + x_2$ , subject to the following constraints  
 $2x_1 + x_2 \geq 3$ ,  $x_2 - x_1 \geq 0$  and  $x_1 \geq 0$ ,  $x_2 \geq 0$

B) Maximize  $z = x_1 + x_2$ , subject to the following constraints  
 $x_1 + x_2 \leq 3$ ,  $-3x_1 + x_2 \geq 3$  and  $x_1 \geq 0$ ,  $x_2 \geq 0$

3. A company makes two kinds of leather belts, A and B. Belt A is high quality belt, and B is of lower quality. The respective profits are Rs 4 and Rs 3 per belt. Each belt of type A requires twice as much time as a belt of type B, and if all belts were of type B, the company could make 1000 belts per day. The supply of leather is sufficient for only 800 belts per day (both A and B combined). Belt A requires a fancy buckle, and only 400 buckles per day are available. There are only 700 buckles available for belt B. Formulate the problem as a LPP and Determine the optimal product mix.

4. DJJ Enterprises manufactures automotive parts. Two of these parts are camshafts and gears. Camshafts earn a profit of \$25 per unit and gears earn \$18 per unit. Three major resources are utilized in the production process: steel, labor, and machine time. It takes 5 lbs of steel to make a camshaft, and 8 lbs to make a gear. Camshafts require 1 hour of labor; gears require 4 hours. It takes 3 hours machine time per camshaft, and 2 hours per gear. For the current planning period, 5000 lbs steel, 1500 hours labor, and 1000 hours machine time are available. DJJ would like to maximize profit during the current planning period, within allowable resources.

5. An airline with a capacity of 200 passengers books two types of tickets – executive class and economy class. Atleast 20 seats have to be reserved for the executive class. But atleast four times the number of people travel by economy class than by the executive class. The profit made on each economy class ticket is 300 and executive class is 400. Formulate the Linear programming to maximize the profit made by the airline and solve the same to find the profit.