Datta Meghe College of Engineering , Airoli

LINEAR PROGRAMMING PROBLEMS

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SENSITIVITY

- **INTRODUCTION :**

➢ The basic idea of Sensitivity Analysis is to be able to give answers to questions of the form:

1. If the objective function changes, how does the solution change?
2. If resources available change, how does the solution change?
3. If a constraint is added to the problem, how does the solution change?

- **DEFINITION :**

- Sensitivity analysis is a systematic study of how sensitive solutions are to (small) changes in the data.
- In sensitivity analysis you evaluate what happens when only one parameter of the problem changes.
- The term sensitivity analysis, sometimes also called post-optimality analysis, refers to an analysis of the effect on the optimal solution of changes in the parameters of problem on the current optimal solution.

EXAMPLE :

Imagine a furniture company that makes tables and chairs. A table requires 40 board feet of wood and a chair requires 30 board feet of wood. Wood costs $1 per board foot and 40,000 board feet of wood are available. It takes 2 hours of skilled labor to make an unfinished table or an unfinished chair. Three more hours of labor will turn an unfinished table into a finished table; two more hours of skilled labor will turn an unfinished chair into a finished chair. There are 6000 hours of skilled labor available. (Assume that you do not need to pay for this labor.) The prices of output are given in the table below:

Product	Price
Unfinished Table	$70
Finished Table	$140
Unfinished Chair	$60
Finished Chair	$110

- **SOLUTION :**

- We want to formulate an LP that describes the production plans that the firm can use to maximize its profits.
- The relevant variables are the number of finished and unfinished tables, I will call them TF and TU , and the number of finished and unfinished chairs, CF and CU . The revenue is (using the table):

$$70TU + 140TF + 60CU + 110CF ,$$

while the cost is $40TU + 40TF + 30CU + 30CF$ (because lumber costs \$1 per board foot).

- The constraints are: 1. $40TU + 40TF + 30CU + 30CF \leq 40000$.

$$2.\ 2TU + 5TF + 2CU + 4CF \leq 6000.$$

- The first constraint says that the amount of lumber used is no more than what is available. The second constraint states that the amount of labor used is no more than what is available.
- Excel finds the answer to the problem to be to construct only finished chairs . The profit is \$106,666.67.