ME324: IEOR

Assignment 02: Simplex Method, Big M-method, Two Phase Method

Department of Mechanical Engineering, IIT Guwahati

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1. Solve the following LP problem using the graphical and simplex methods, and compare their solutions.

   $Maximize\ z = 4x_1 + 3x_2,$
   $subject\ to\ (i)\ 2x_1 + x_2 \leq 1000; (ii)\ x_1 + x_2 \leq 800; (iii) x_1 \leq 400; (iv)\ x_2 \leq 700,$
   $x_1, x_2 \geq 0.$

2. Solve the following LP problem using the simplex method.

   $Maximize\ z = x_1 + x_2 + x_3,$
   $subject\ to\ (i)\ 4x_1 + 5x_2 + 3x_3 \leq 15; (ii)\ 10x_1 + 7x_2 + x_3 \leq 12,$
   $x_1, x_2, x_3 \geq 0.$

3. Solve the following LP problem using the graphical and simplex methods, and compare their solutions.

   $Minimize\ z = 3x_1 - x_2,$
   $subject\ to\ (i)\ 2x_1 + x_2 \geq 2; (ii)\ x_1 + 3x_2 \leq 2; (iii)\ x_2 \leq 4,$
   $x_1, x_2 \geq 0.$

4. Solve the following LP problem using the simplex method.

   $Minimize\ z = 2x_1 + x_2,$
   $subject\ to\ (i)\ 3x_1 + x_2 = 3; (ii)\ 4x_1 + 3x_2 \geq 6; (iii)\ x_1 + 2x_2 \leq 4,$
   $x_1, x_2 \geq 0.$

5. ABC Printing Company is facing a tight financial squeeze and is attempting to cut costs wherever possible. At present it has only one printing contract and, luckily, the book is selling well in both the hardcover and the paperback editions. It has just received a request to print more copies of this book in either the hardcover or the paperback form. The printing cost for the hardcover book is INR 600 per 100 books while for paperback is only INR 500 per 100 books. Although the company is attempting to economize, it does not wish to lay off any employee. Therefore, it feels obliged to run its two printing presses – I and II, at least 80 and 60 hours per week, respectively. Press – I can produce 100 hardcover books in 2 hours or 100 paperback books in 1 hour. Press – II can produce 100 hardcover books in 1 hour or 100 paperbacks book in 2 hours. Determine how many books of each type should be printed in order to minimize cost. (HINT: Formulate an LP problem, use different types of variables as applicable and use appropriate simplex method.)