Indian Institute of Technology Roorkee

Optimization Techniques (MAN-010)

REVISED SIMPLEX METHOD AND INTEGER LINEAR PROGRAMMING

Ex-8

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1. Solve the following problems by the revised simplex method:
   (a) $\text{Max } z = 2x_1 + x_2,\ 3x_1 + 4x_2 \le 6,\ 6x_1 + x_2 \le 3,\ x_1,\ x_2 \ge 0,$
   (b) $\text{Max } z = 6x_1 - 2x_2 + 3x_3,\ 2x_1 - x_2 + 2x_3 \le 2,\ x_1 + 4x_3 \le 4,\ x_1, x_2, x_3 \ge 0,$
   (c) $\text{Min } z = 2x_1 + x_2,\ 3x_1 + x_2 = 3,\ 4x_1 + 3x_2 \ge 6,\ x_1 + 2x_2 \le 3,\ x_1, x_2 \ge 0.$

2. Solve the following problems by the branch & bound algorithm :
   (a) $\text{Max } z = 3x_1 + 4x_2,\ 7x_1 + 16x_2 \le 52,\ 3x_1 - 2x_2 \le 9,\ x_1, x_2 \ge 0$ & integers,
   (b) $\text{Max } z = x_1 + x_2,\ 2x_1 + 5x_2 \le 16, 6x_1 + 5x_2 \le 30,\ x_1\, x_2 \ge 0$ & integers,
   (c) $\text{Min } z = 9x_1 + 10x_2,\ 4x_1 + 3x_2 \ge 40, x_1 \le 9, x_2 \le 8, x_1\, x_2 \ge 0,\ x_2$ integer,
   (d) $\text{Max } z = 2x_1 + 3x_2,\ 5x_1 + 7x_2 \le 35,\ 4x_1 + 9x_2 \le 36,\ x_1, x_2 \ge 0$ & integers,

3. Solve by Gomory's all integer (fractional) algorithm. Also, show the cuts graphically in x_1x_2- plane.
   (a) $\text{Min } z = 4x_1 - 5x_2,\ -3x_1 + x_2 \le 6,\ 2x_1 + 5x_2 \le 12,\ x_1, x_2 \ge 0$ & integers,
   (b) $\text{Max } z = x_1 + 2x_2,\ x_1 + 2x_2 \le 12, 4x_1 + 3x_2 \le 14,\ x_1\, x_2 \ge 0$ & integers,
   (c) $\text{Max } z = x_1 + x_2,\ 3x_1 + 2x_2 \le 5,\ x_2 \le 2,\ x_1, x_2 \ge 0$ & integers,
   (d) $\text{Max } z = 7x_1 + 9x_2,\ -x_1 + 3x_2 \le 6, 7x_1 + x_2 \le 35,\ x_1, x_2 \ge 0$ & integers,

4. Solve the problems in Question 3 by Gomory's mixed integer algorithm if only x_1 is required to be an integer. Also, show the cuts graphically in x_1x_2- plane.

ANSWERS:

1. (a) (2/7 , 9/7 ; 13/7) , (b) (4, 6, 0 ; 12) (c) (3/5 , 6/5 ; 12/5)
2. (a) (2, 2; 14); (b) (5, 0), (4, 1), (3, 2); 5 (d) (7, 0; 14)
3. (a) (0 , 2 ; –10) , (b) (0, 4 ; 8) (c) (0, 2) , (1 , 1) ; 2 (d) (4, 3 ; 55)
4. (d) (4, 10/3 ; 58)