Advance Engineering Mathematics(AEM)

Branch :Information Technology, Sem:IIIrd

Dr. Kashish Parwani

Associate Professor, Dept. of Mathematics

JECRC, Sitapura Jaipur

Vision of the Institute

To become a renowned centre of outcome based learning, and work towards academic, professional, cultural and social enrichment of the lives of individuals and communities

Mission of the Institute

- Focus on evaluation of learning outcomes and motivate students to inculcate research aptitude by project based learning.
- Identify, based on informed perception of Indian, regional and global needs, the areas of focus and provide platform to gain knowledge and solutions.
- Offer opportunities for interaction between academia and industry.
- Develop human potential to its fullest extent so that intellectually capable and imaginatively gifted leaders may emerge.

Course Outcomes

- **CO2:** To learn the formulation of different mathematical problems into optimization problems.
- **CO3:** Apply the principles of optimization using differential calculus.
- **CO4:** To understand the concepts of Linear Programming
- **CO1:** To learn the concepts and principles of Random variables and Probability distribution.

Two Phase Method

- For greater than or equal to constraint, the slack variable has a negative co efficient
- Equality constraints do not have slack variables
- If either of constraint is part of the model, there is no convenient IBFS and hence two phase method is used.

1. In this phase, we find an IBFS to the original problem for this all artificial variable are to be driven to zero.. To do this an artificial objective function (Z*) is created which is the sum of all artificial variables,, The new objective function is then subjected to the constraints of the given original problem using the simplex method At the end of Phase I, three cases arises.

   A. If the minimum value of Z*=0, and no artificial variable appears in the basis at a positive level, then the given problem has no feasible solution and procedure terminates.

B. If the minimum value of the $Z^*=0$, and no artificial variable appears in the basis, then a basic feasible solution to the given problem is obtained.
C. If the minimum value of the $Z^*=0$ and one or more artificial variable appears in the basis at Zero level, then a feasible solution to the original problem is obtained. However, we must take care of this artificial variable and see that it never become positive during Phase II computations.

Phase II

- When Phase I results in (B) or (C), we go on for Phase II to find optimum solution to the given LP problem. The bais feasible solution found at the end of Phase I now used as a starting solution for the original LP problem. Mena that find table of Phase I becomes initial table for Phase II in which artificial (Auxiliary) objective function is replaced by the original objective function. Simplex method is then applied to arrive at optimum solution.

Solve the following LPP by Two Phase Method

Min. $Z = x_1+x_2$

Sub. to

$$2x_1 + x_2 \geq 4$$

$$x_1+7x_2 \geq 7$$

$$X_{1,} x_2 \geq 0$$

Solution : We first convert the minimization problem to maximization.

Max. $(-z)=z^{|} = -x_1 - x_2$

$2x_1 + x_2 + s_1 - s_3 = 4$

$x_1 + 7x_2 + s_2 - s_4 = 7$

$x_1, x_2, s_1, s_2, s_3, s_4 \geq 0$

Table 1.

Phase 1 : The Problem of phase 1 is

Max. $Z^1 = 0.x_1 + 0.x_2 + 0.s_1 + 0s_2 - s_3 - s_4$

C.V	B.v.	C_j / X_B	0	0	0	0	-1	-1	
			x_1	x_2	s_1	s_2	s_3	s_4	Min Ratio
-1	s_3	4	2	1	1	0	-1	0	$\frac{4}{1}$
-1	s_4	7	1	$\boxed{7}$	0	1	0	-1	$\frac{7}{7}$
	Z_J	$-C_J$	-3	-8	1	1	0	0	
				↑				↓	

Table 2.

C. V	B.v.	C_j / X_B	0 x_1	0 x_2	0 s_1	0 s_2	-1 s_3	-1 s_4	Min Ratio
-1	s_3	3	13/7	0	-1	1/7	1	-1/7	21/13
0	X_2	1	1/7	1	0	-1/7	0	1/7	7/1
			-13/7	0	1	-1/7	0	8/7	
			↑				↓		

Table 3.

C.V	B.v.	C_j / X_B	0 / x_1	0 / x_2	0 / s_1	0 / s_2	-1 / s_3	-1 / s_4	Min Ratio
0	X_1	21/23	1	0	-7/13	1/13	7/13	-1/13	21/13
0	X_2	10/13	0	1	1/13	-14/19	-1/13	14/91	7/1
			0	0	0	0	1	1	

Dr. Kashish Parwani
Associate Professor (Mathematics) JECRC, Jaipur

Phase II

Table 1.

C.V	B.v.	C_j / X_B	0 / x_1	0 / x_2	0 / s_1	0 / s_2
-1	X_1	21/23	1	0	-7/13	1/13
-1	X_2	10/13	0	1	1/13	-14/19
			0	0	6/13	1/13

Dr. Kashish Parwani
Associate Professor (Mathematics) JECRC, Jaipur

Thus the optimal solution is given by X_1=21/13, X_2=10/13 and Z_{min}= 31/13

Thank You