International Journal of Latest Research in Science and Technology **ISSN (Online):2278-5299**
Volume 4, Issue 6: Page No.40-42, November-December 2015 (special Issue Paper)
http://www.mnkjournals.com/ijlrst.htm
Special Issue on International conference on Methematics Sciences-2015(MSC-2015)
Confernece Held at Sadguru Gadage Maharaj College, Karad ,Maharastra,(India)

MATHEMATICS THE QUEEN OF SCIENCE IN LPP PROBLEM.

A.S.Salunkhe
D.P.Bhosale College Koregaon, Dist.-Satara
E.mail-assalunkhe66@gmail.com Mob-8600281496

Abstract- ***Mathematics is the queen of science. Mathematics usually used in everywhere in this world because we could not do any calculations without mathematics .Mathemaical problem is an important technique for the solutions of problems in everywhere in the world. The aim of this paper is not to produce new Mathematics but to develop the ideas and concepts from mathematics in such a way that students develops their problem solving technique in Mathematics and can apply the process to everywhere .Here present paper is study of linear programming problemlinear programming problem is the problem of optimization of linear expression in certain number of variables which satisfy some conditions called constraints .such problems arise in manufacturing or producing units where the costs are to be minimizedand profits are to be maximized by properly allocating resources such as labour, materials, machines ,capital etc. The important contribution of the study will berecognition and relationship between known mathematical results the objective is general i.e. toenrich the educational qualities in rural areas &to study the real lifeproblem.***
Keyword: -Functions, Variables, inequalities, constraints, co-ordinate system,graphs.

I. INTRODUCTION

The first linear programming formulation of a problem that is equivalent to the general linearprogramming problem was given by Leonid Kantorovich in 1939, who also proposed a method forsolving it. He developed it during World War II as a way to plan expenditures and returns so as toreduce costs to the army and Kantorovich, the Dutch-American economist T. C. Koopmans formulated classical economic problemsas linear programs. Kantorovich and Koopmans later shared the1975 Nobel prize in economics.[1] In1941, Frank Lauren Hitchcock also formulated transportation problems as linear programs and gave asolution very similar to the later Simplex method;[2] Hitchcock had died in 1957 and the Nobel prize isnot awarded posthumously.In 1947, George B. Dantzigpublished the simplex method and John vonNeumann developed the theory of duality as a linear optimization solution, and applied it in the fieldof game theory. Postwar, many industries found its use intheir daily planning.Dantzig's originalexample was to find the best assignment of 70 people to 70 jobs.The computing power required to test all the permutations to selectthe best assignment is vast; the number of possible configurationsexceeds the number of particles in the observable universe. However, it takes only a moment to findthe optimum solution by posing the problem as a linear program and applying the simplex algorithm.The theory behind linear programming drastically reduces the number of possible solutions that mustbe checked.The linear-programming problem was first shown to be solvable in polynomial time by LeonidKhachiyanin 1979, but a larger theoretical and practical breakthrough in the field came in 1984when NarendraKarmarkarintroduced a new interior-point method for solving linear-programmingproblems.

The linear programming problem consists of the following three parts:
A linear function to be maximized
$Z = c_1x_1+c_2x_2+c_3x_3+.............+cnxn$ subject to
Problem constraintsof the following form
$a_{11}x_1+a_{12}x_2+a_{13}x_3+...........+a_{1n}x_n\leq b_1$
$a_{21}x_1+a_{22}x_2+a_{23}x_3+............+a_{2n}x_n\leq b_2$
$a_{31}x_1+a_{32}x_2+a_{33}x_3+.............+a_{3n}x_n\leq b_3$
……………………………………………………
…………………………………………………………
…………………………………………….…
$a_{m1}x_1+a_{m2}x_2+a_{m3}x_3+............+amnxn\leq bm$ where
Non-negative variables $x_1\geq 0$,$x_2\geq 0$ $x_3 \geq 0$..............$xn\geq 0$.and z is a objective function linear programming is the process of taking various linear inequalities relating tosome situation, andfinding the "best" value obtainable under those conditions. In "real life", linear programming is part of avery important area of mathematics called "optimization techniques". These fields of study are usedevery day in the organization and allocation of resources. The general process for solving linear programming exercises is to graph the inequalities (called the "constraints") to form a walled-off areaon the *x*,*y*-plane (called the "feasibility region"). Then you figure out the coordinatesof the corners ofthis feasibility region (that is, you find the intersection points of the various pairs of lines), and testthese corner points in the formula (called the "optimization equation") for which you're trying to findthe highest or lowest value.

Mathematical Formulation of Linear Programming Problems

There are mainly four steps in the mathematical formulation of linear programming problem as a mathematical model. We will discuss formulation of those problems which involve only two variables.

(1) Identify the decision variables and assign symbols x and y to them. These decision variables are those quantities whose values we wish to determine.

(2) Identify the set of constraints and express them as linear equations/inequations in terms of the decision variables. These constraints are the given conditions.

(3) Identify the objective function and express it as a linear function of decision variables. It might take the form of maximizing profit or production or minimizing cost.

(4) Add the non-negativity restrictions on the decision variables, as in the physical problems, negative values of decision variables have no valid interpretation.

Steps to be followed in solving a Linear Programming Problem

1. Define the variables if they are not already defined in the problem, i.e. Let x be and y be variables.
2. Write down the constraints in terms of the variables.
3. Graph the constraints and shade the Feasible Region .
4. Write down the Objective Function in terms of the variables.
5. Using the gradient of the objective function, draw a Search Line. Use this line to maximize or minimize the objective function.

There are many real life situations where an LPP may be formulated. The following examples will help to explain the mathematical formulation of an LPP.

For example: - A diet is to contain at least 4000 units of carbohydrates, 500 units of fat and 300 units of protein. Two foods A and B are available. Food A costs 2 dollars per unit and food B costs 4 dollars per unit. A unit of food A contains 10 units of carbohydrates, 20 units of fat and 15 units of protein. A unit of food B contains 25 units of carbohydrates, 10 units of fat and 20 units of protein. Formulate the problem as an LPP so as to find the minimum cost for a diet that consists of a mixture of these two foods and also meets the minimum requirements.The above information can be represented as

Food Type	Carbo hydrates	Fat	Protein	Cost in dollars Per unit
A	10	20	15	2
B	25	10	20	4
Requirement	4000	500	300	

Let the diet contain x units of A and y units of B.Total cost = 2x + 4y

The LPP formulated for the given diet problem isMinimize Z = 2x + 4y

subject to the constraints $10x + 25y \geq 4000$, $20x + 10y \geq 500$, $15x + 20y \geq 300$ Where $x \geq 0,\ y \geq 0$

For example:-. In the production of 2 types of toys, a factory uses 3 machines A, B and C. The time required to produce the first type of toy is 6 hours, 8 hours and 12 hours in machines A, B and C respectively. The time required to make the second type of toy is 8 hours, 4 hours and 4 hours in machines A, B and C respectively. Themaximum available time (in hours) for the machines A, B, C are 380, 300 and 404 respectively. The profit on the first type of toy is 5 dollars while that on the secondtype of toy is 3 dollars. Find the number of toys of each type that should be produced to get maximum profit.

Mathematical Formulation

The data given in the problem can be represented in a table as follows.

Machine	Time Required (in hours)		Maximum time available in hrs
	Type I	Type II	
A	6	8	380
B	8	4	300
C	12	4	404

Let x = number of toys of type-I to be produced

y = number of toys of the type – II to be produced

Total profit = 5x + 3y

The LPP formulated for the given problem is:

Maximize Z = 5x + 3y subject to the constraints

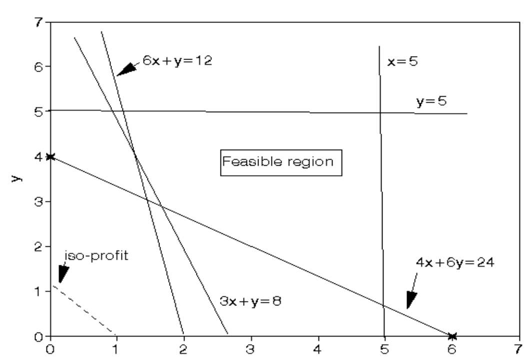
$6x + 8y \leq 380$, $8x + 4y \leq 300$, $12x + 4y \leq 404$ where $x \geq 0,\ y \geq 0$

Graphical Solution of Linear Programming Problem:

Let us take the following example:

minimize Z = 180x + 160y subject to 6x + y >= 12 , 3x + y >= 8 , 4x + 6y >= 24 , x <= 5 , y <= 5 where x,y>= 0

Since there are only two variables in this LP problem we have the graphical representation of the LP given below with the feasible region (region of feasible solutions to the constraints associated with the LP) outlined.



To draw the diagram above we turn all inequality constraints into equalities and draw the corresponding lines on the graph (e.g. the constraint 6x + y >= 12 becomes the line6x + y = 12 on the graph). Once a line has been drawn then it is a simple matter to work out which side of the line corresponds to *all* feasible solutions to the original inequality constraint (e.g. *all* feasible solutions to 6x + y >= 12 lie to the right of the line 6x + y = 12).We determine the optimal solution to the LP by plotting (180x + 160y) = K (K constant) for varying K values (iso-profit lines). One such line (180x + 160y = 180) is shown dotted on the diagram. The smallest value of K (remember we are considering a minimization problem) such that 180x + 160y = K goes through a point in the feasible region is the value of the optimal solution to the LP (and the corresponding point gives the optimal values of the variables).

Hence we can see that the optimal solution to the LP occurs at the vertex of the feasible region formed by the intersection of 3x + y = 8 and 4x + 6y = 24. Note here that it is *inaccurate* to attempt to read the values of x and y off the graph and instead we solve the simultaneous equations

- 3x + y = 8
- 4x + 6y = 24

to get x = 12/7 = 1.71 and y = 20/7 = 2.86 and hence the value of the objective function is given by 180x + 160y = 180(12/7) + 160(20/7) = 765.71

Hence the optimal solution has cost 765.71

It is clear that the above graphical approach to solving LP's can be used for LP's with two variables but most LP's have more than two variables. This brings us tothe *simplex* algorithm for solving LP's.

Applications of linear programming problem:-

1) Minimization of production cost &Maximization of profit.

2) Applications of Linear Programming in the Diet Problem

3) In real world problem Linear Programming is used etc.

Scientific advantage of lpp problem in fuzzy Mathematics:-

Applications of linear programming problem in fuzzy Mathematics are asfollows:-

Applications of fuzzy linear programming Fuzzy Linear Programs (FLP) were developed to tackle problems encountered in real-world applications. The following list showsthat the applications of FLP are numerous: and diverse. Agricultural economics: • analysis of water use in agriculture (Owsinski, Zadrozny and Kacprzyk, 1987); • feed mix (Lai and Hwang, 1992);

• farm structure optimization problem (Czyzak, 1990); • regional resource allocation (Leung, 1988; Mjelde, 1986); • water supply Planning(Slowinski,1986, 1987). Assignment problems: • network location problem (Darzentas, 1987). Banking and finance: • capital asset pricing model (Ostermark, 1989); • profit apportionment in concern (Ostermark, 1988); • bank hedging decision (Lai and Hwang, 1992); • project investment (Hanuscheck, 1986; Wolf, 1988; Lai and Hwang, 1992). Environment management: • air pollution regulation problem (Sommer and Pollatschek, 1978); • energy emission models (Oder and Rentz, 1993). Manufacturing and production: • aggregate production planning problem (Verdegay, 1987); • machine optimization problems (Trappey, Liu and Chang, 1988); • magnetic tape production (Wagenknecht and Hartmann, 1987); • optimal allocation of production of metal (Ran~k and Rimanek, 1987); • optimal system design (ZeleReferences Bellman, R.E., andZadeh, L.A. (1973), "Decision-making in a fuzzy environment", Management Science 17, 149-156.Bortolan, G., and Degani, R. (1985), "Ranking fuzzy subsets", Fuzzy Setsand Systems 15, 1-19. Buckley, J.J. (1988), "Possibilistic Linear Programming with triangular fuzzy numbers", Fuzzy Sets and Systems 26, 135-138. Buckley, JJ. (1989),"Solving possibilistic Linear Programming problems", Fuzzy Sets and Systems 31,329-341.Carlsson, C., and Korhonen, P. (1986), "A parametric approach to fuzzy linear programming",

REFERENCES

1. Howard Eves, An Introduction to the History of Mathematics, Sixth Edition, Saunders, (1990).
2. Brechner, Robert, Contemporary Mathematics for Business and Consumers (2006).
3. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, Introduction to Algorithms, Second Edition.MIT Press and McGraw-Hill,(2001).
4. Latouche G., Ramaswami, Introduction to matrix V, (1999).
5. Mathematical Techniques by Welling.
6. G.B Dantzig, Maximization of a linear function of variables subject to linear inequalities, (1947), Published pp. 339–347 in T.C. Koopmans (ed.).
7. Activity Analysis of production and Allocation, New York-London (1951), (Wiley & Chapman-Hall).
8. J. E. Beasley, editor. Advances in Linear and Integer Programming Oxford Science, (1996). (Collection of surveys)
9. R. G. Bland, New finite pivoting rules for the simplex method, Math. Oper.Res. 2, (1977), 103–107.
10. Fuzzy Sets and Systems 20, 17-30. Chanas, S. (1989), "Fuzzy programming inmultiobjective linear programming - A parametric approach", Fuzzy Sets and Systems 29,303-313.
11. Czyzak, P. (1990), "Application of the 'FLIP' method to farm structure optimization under uncertainty", in: R. Slowinski and J. Teghem (eds.), Stochastic Versus.
12. Fuzzy Approaches to Multiobjective Mathematical Programming under Uncertainty, Reidei, Dordrecht, 263-278. Darzentas, J. (1987), "On fuzzy location models",.
13. J. Kacprzyk and S.AOrlovski (eds.), Optimization Models Using Fuzzy Sets and Possibility Theory, Reidel, Dordrecht, 328-341. Delgado, M.,Verdegay, J.L. and Vila, M.A. (1989), "A general model for fuzzy linear programming", Fuzzy Sets and Systems 29, 21-30. Dubois, D. and Prade, H.(1980).
14. Fuzzy Sets and Systems: Theoryand Applications, Academic Press, New York. Dubois, D. and Prade, H., (1989).
15. "Ranking of fuzzy numbers in the setting of possibility theory", Information Sciences 30, 183-224. Hannah, E.L. (1981).
16. Linear programming with multiple fuzzy goals", Fuzzy Sets and Systems 6,235-248.
17. Hanuseheck,R.(1986),lnvestitionsplanungaufderGrundlagevager Daten, Schulz-Kirchner Verlag, Idstein. Kacprzyk, J. (1979).
18. "A branch and bound algorithmfor the multistage control of a fuzzy system in a fuzzy environment", Kybernetes 8, ny, (1986);
19. crude oilmanufacturing ,Wagenknecht and Hartmann, (1987).