# AN APPROACH FOR TRANSPORTATION PROBLEM UNDER BOUNDEDNESS

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**Abstract:** This article discusses a methodology to solve a special class of three dimensional transportation problem. The transportation problem is expounded by defining parallel transportation problem. Equivalence is established between two problems The model under consideration has been applied to public distribution system of North Delhi. A computing software Lingo software 17.0 has been used to solve the problem under consideration.

**Keywords:** Boundedness; Transportation Problem; Rim-Conditions; Lingo software; Optimal solution;

## 1. INTRODUCTION

A transportation problem is special class of linear programming problem. In this problem under consideration, a homogenous commodity is available in known quantity at each of origins which needs to be transported to each of *the* destinations. The cost of transporting one unit of commodity from origin to destination is known. The objective is to determine the transportation schedule which maximizes/minimize total transportation cost . This transportation model is solved on assumption total quantity required at the destinations is equal to total quantity available at each of the origins. Zhang [12] presen three different uncertain transportation model in which both variable cost and fixed cost are taken into consideration. An algorithm on the basis of tabu search algorithm as also theory of uncertainty is presented.

Malhotra N.[8] studied minimization transportation problem in three dimension and discussed impair flow in transportation problem. Jalil[7] and Tzeng[11] explained planning of annual coal purchase by formulating fuzzy solid transportation problem and provide allocation schedule , the authority of Taiwan. In this study, they have perceived cost-time trade off pair but problem that they have studied is not bounded which gave a direction to the author to study three dimensional transportation problem under conditions of boundedness .

F(I,j) = quantity of commodity transported from origin I to port j; Z(I,j) = transport cost of commodity (independent of
commodity type)

ß(I,j) and Ế(I,j) being lower and upper bounds on quantity of commodity transported from I to j.

## 2.Mathematical Formulation and solution of Problem

The problem considered can be formulated as

$$\text{Min } \Sigma Z^t X$$

(TP) Subject to

$$ß1(I,j) \leq \Sigma X \leq Ế1(I,j) \text{ for all I \& k}$$

$$ß2(I,j) \leq \Sigma X \leq Ế2(I,j) \text{ for all j \& k}$$

where X is bounded integer variable in three dimensions.

The problem is unbalanced in behavior as the quantity of products received by all destinations, quantity of products supplied from all origins to all destinations and quantity of distinct types of products supplied from all origins are not equal. The problem has solution when it is balanced. I ntroduce dummy row , dummy column, dummy product to balance problem. This leads to the formulation of a related transportation problem(TP1) which is balanced and hence, possess a feasible solution.

$MinF=(7x_{111}+x_{112}+2x_{113})+(2x_{121}+x_{122}+5x_{123})+(2x_{131}+x_{132}+2x_{133})+(2x_{141}+x_{142}+4x_{143})+(x_{211}+5x_{212}+3x_{213})+(x_{221}+4x_{222}+x_{223})+(5x_{231}+3x_{232}+x_{233})+(3x_{241}+4x_{242}+2x_{243})+(x_{311}+3x_{312}+4x_{313})+(4x_{321}+x_{322}+5x_{323})+(3x_{331}+2x_{332}+2x_{333})+(2x_{341}+x_{342}+2x_{343})$

s.to

$4\leq x_{111}+x_{121}+x_{131}+x_{141}\leq 34$

$2\leq x_{112}+x_{122}+x_{132}+x_{142}\leq 45$

$3 \leq x_{113}+x_{123}+x_{133}+x_{143}\leq 73$

$3 \leq x_{312}+x_{322}+x_{332}+x_{342}\leq 53$

$3 \leq x_{313}+x_{323}+x_{333}+x_{343}\leq 51$

$4 \leq x_{111} + x_{211} + x_{311} \leq 54$
$3 \leq x_{112} + x_{212} + x_{312} \leq 54$
$4 \leq x_{113} + x_{213} + x_{313} \leq 54$
$1 \leq x_{121} + x_{221} + x_{321} \leq 32$
$2 \leq x_{122} + x_{222} + x_{322} \leq 42$
$1 \leq x_{123} + x_{223} + x_{323} \leq 72$
$2 \leq x_{131} + x_{231} + x_{331} \leq 51$
$4 \leq x_{132} + x_{232} + x_{332} \leq 44$
$1 \leq x_{133} + x_{233} + x_{333} \leq 67$
$4 \leq x_{141} + x_{241} + x_{341} \leq 74$
$1 \leq x_{142} + x_{242} + x_{342} \leq 61$

$3 \leq x_{111} \leq 30, 1 \leq x_{112} \leq 60, 0 \leq x_{113} \leq 70$
$1 \leq x_{121} \leq 30, 2 \leq x_{122} \leq 70, 0 \leq x_{123} \leq 50$
$2 \leq x_{131} \leq 50, 0 \leq x_{132} \leq 70, 0 \leq x_{133} \leq 40$
$0 \leq x_{141} \leq 40, 0 \leq x_{142} \leq 50, 0 \leq x_{143} \leq 50$
$1 \leq x_{211} \leq 40, 1 \leq x_{212} \leq 70, 0 \leq x_{213} \leq 50$
$0 \leq x_{221} \leq 20, 1 \leq x_{222} \leq 60, 0 \leq x_{223} \leq 60$
$0 \leq x_{231} \leq 40, 3 \leq x_{232} \leq 70, 2 \leq x_{233} \leq 70$

The problem has been solved using the Lingo software.$x_{111} = 2.500$ meaning 1 unit of wheat is supplied from Punjabi Bagh to fair value shop.Value of other decision variables is computed using the same interpretation. The minimum transportation cost is seventy three thousand rupees following transportation schedule.

| | | | |
|---|---|---|---|
| $x_{111} = 120$<br>$x_{112} = 1.00$<br>$x_{113} = 2.10$ | $x_{121} = 1.10$<br>$x_{122} = 2.20$<br>$x_{123} = 0.00$ | $x_{131} = 3.00$<br>$x_{132} = 2.00$<br>$x_{133} = 0.00$ | $x_{141} = 2.00$<br>$x_{142} = 1.40$<br>$x_{143} = 2.10$ |
| $x_{211} = 1.00$<br>$x_{212} = 3.00$<br>$x_{213} = 0.00$ | $x_{221} = 4.00$<br>$x_{222} = 1.10$<br>$x_{223} = 0.00$ | $x_{231} = 0.00$<br>$x_{232} = 1.10$<br>$x_{233} = 2.00$ | $x_{241} = 1.20$<br>$x_{242} = 1.30$<br>$x_{243} = 2.00$ |
| $x_{311} = 1.00$<br>$x_{312} = 1.00$<br>$x_{313} = 2.00$ | $x_{321} = 0.00$<br>$x_{322} = 1.00$<br>$x_{323} = 2.00$ | $x_{331} = 0.00$<br>$x_{332} = 1.00$<br>$x_{333} = 2.00$ | $x_{341} = 2.00$<br>$x_{342} = 0.00$<br>$x_{343} = 0.00$ |

The solution so obtained is optimal to the problem considered in this article and involves lesser calculations and time.

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