The Transportation Problem - The Transport problem is to transport various amounts of a single homogeneous commodity, that are initially stroved at various orisins, to different distinations in such a way that the total transportations cost is a minimum.

For example - A tyre manufaturing concern has m factories located in different cities. The Total supply

		. 1 -		A	lactured	product 15
		poten	Liar c	ey ton in	123	- Avaibbility
	mortif	Trank	X colt	У	て	1
Factoria	A	CII	C12	C13	4	b1
100.	B	Cal	Caa	⁽ 2)	C24	b ₂
	C	cyl	C32	c33	^C 34	b ₃
Requirem	et	d	92	03	dy	

L.P.P. of this Toans portation problem is

Minimise Z = C₁₁ X₁₁ + C₁₂ X₁₂ + ··· + C₃₄ X_{3n} -) Objective Jud subject to $a_{11}x_{11} + a_{12}x_{12} + \cdots + a_{14}x_{14} \leq b_{1}$ 931 ×31 + 92 ×32 + ··· + 934 ×34 < 6,

a,, n, + a2, n2, +9, n3, + au, n4, 7, d1 any 114+ 024 1/27+ 034 734 +944744 > d4 x11 >,0.

So, T. Pro. is minimize = TE Cij Xij subject m - wisbi

j=1 i=1 " E all XII & bi Paixxii > dj xij>, 0.

here assumed that $\Sigma a_i = \Sigma b_J V$ Eai + E bi

Fearble 8019: - A set of non-negative induced allocation (x/j) 20) which simultaneously removes depiciencies is called the pearible 20/19 B.F.S. - A F.S. to a m-orising, n-desti nations broblem is said to be a basic if the no. of the allocations

of the no-of allocations is a basic sold are

lus than m+n-1, it is called degenate 2017. Cotherwise non-degenerale 20/1).

obtinum soln- A Elavible soln is said to be obtinum if it minimize the total transportation cost.

Note: A newsgary and sufficient condition for the existence of peasible 301 of a T.P. is Σ ai = Σ bi

Note 2 - The number of basic variables in a T.P. are

Note 2 - The number of basic variables in a T.P. are at most m+n-1.

Existence of an optimal solution

There always exists an optimal solution to a balanced transportation problem

Methods for initial basic feasible solution

By North - West Corner Rule(Steping Stone Method)

Example-1

Warehouse → Factory ↓	W_1	W ₂	<i>W</i> ₃	W ₄	Factory Capacity
F.	19	30	50	10	7
F.	70	30	40	60	9
r ₂	40	8	70	20	18
Warehouse	5	8	7	14	34
Requirement	5				

Ans

	И	V	W_2	T	W_3)	W_4	Ava	ilabili	ty
F_I —	19	2ا/	30	12		Sq		lo	7	20	
$\overline{F_2}$	70		30	16	3	بلهد	3	60	9	3	,
F_3	y	0	18		뀔.	70		20/14	18	114	0
Requirements	5/		8/		ν,			14/ ₀			
	/ 0		1	0		1 0	Ĉ				

	W_{I}	W_2	W_3	W_4	Availability
$\overline{F_{I}}$	19 13	2 30 L	2		7
$\overline{F_2}$		30 E	621 4	0.	9
$\overline{F_3}$			70	14 2	18 مر
Requirements	5	8	7	14	

Boxic
$$301^n$$
 is = $10 \times 5 + 30 \times 2 + 30 \times 6 + 3 \times 40$
+ $4 \times 70 + 14 \times 20 = 1015$.

Second Method: The Row Minimum Method

Warehouse → Factory ↓	w_1	W ₂	<i>W</i> ₃	W ₄	Factory Capacity
F.	19	30	50	10	7
F.	70	30	40	60	9
F	40	8	70	20	18
Warehouse	5	8	7	14	34

W_1	W ₂	<i>W</i> ₃	W ₄	Factory Capacity
19	30	50	10	7
70	30	40	60	9
40	8	70	20	18
5	8	7	14	34
	W ₁ 19 70 40 5	20	W1 W2 W3 19 30 50 70 30 40	19 30 50 10 70 30 40 60

	W_{I}	W_2	W_3	W_4	Availability	
F_I	19	3	0	30 7	10	
F_2	70	81	1 0 5	40	60910	
$\overline{F_3}$ 5	Juo		8 6	70 71	20 18 41 160)
Requirements 5		80	7	14-1		

Check the minimum

- value in row wide

- min {19, 30, 80,10}

= 10

Now {7,14} = 7

					» X is
	W_I	W_2	W_3	W_4	Availability
F_I				7 10	7
$\overline{F_2}$		30	J 40		9
$\overline{F_3}$	<u>5</u> 40		6 70	7 20	18
Requirements	5	8	7	14	

$$m+n-1=3+4-1=6$$

$$\frac{Pm}{min} = \frac{7x10 + 8x30 + 1x40 + 5x40}{+6x70 + 7x20}$$
= 1110 Rs.

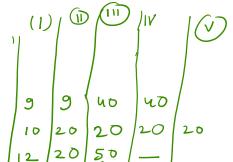
Vogel's Approximation Method(Unit Cost Penalty Method)

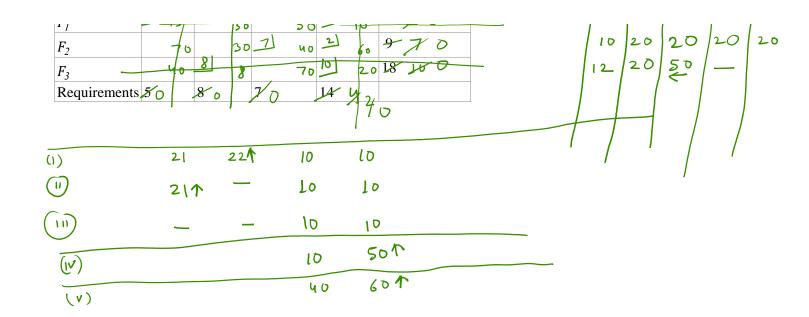
Warehouse → Factory ↓	W_1	W ₂	<i>W</i> ₃	W_4	Factory Capacity
E.	19	30	50	10	7
F	70	30	40	60	9
F 2	40	8	70	20	18
Washaman I	5	8	7	14	34
Warehouse Requirement	,	S-20			

Try to find the penalty cost:

- 1. This can be find by using the difference between the smallest and next smallest costs in each row and column respectively.
- 2. Now choose the maximum penalty. ~

	$W_{I_{-I}}$	W_2	W_3	W_4	Availability
F_I	5 19	30	50	2	7 20
F_2	70	30	<u> 1</u> 40	21 60	970
F.	Va_	8	70	10 20	18 100





	W_I	W_2	W_3	W_4	Availability
F_{I}	5) 13			2 10	7
$\overline{F_2}$			7 40	2) 60	9
$\overline{F_3}$		81 8		10] 20	18
Requirements	5	8	7	14	

$$m+n-1 = 6$$
 $m + n - 1 = 6$
 $m + 1 =$

The End