allot availability as $\sum_{j=1}^{n} b_j - \sum_{i=1}^{m} a_i$ and the cost from this dummy origin to any destination is taken as zero.

<u>Example 1</u> Find a basic feasible solution by North-West corner rule to the following transportation problem:

DESTINATIONS

ORIGINS						
	2	11	10	3	7	4
	1	4	7	2	1	8
	3	9	4	8	12	9
	3	3	4	5	6	

Solution: Here $\sum_{i=1}^{3} a_i = \sum_{j=1}^{n} b_j = 21$, so it is a balanced TP. Now we find a basic feasible solution by North-West corner rule, the steps are shown in the following tables:

	D_1	D_2	D_3	D_4	D_5	a_i
O_1	$\boxed{3}$ 2	11	10	3	7	~~4~~ 1
O_2	1	4	7	2	1	8
O_3	3	9	4	8	12	9
b_j	~~3~~	3	4	5	6	

$\rightarrow$

	D_2	D_3	D_4	D_5	
O_1	$\boxed{1}$ 11	10	3	7	~~1~~
O_2	4	7	2	1	8
O_3	9	4	8	12	9
	~~3~~ 2	4	5	6	

$\rightarrow$

	D_2	D_3	D_4	D_5	
O_2	$\boxed{2}$ 4	7	2	1	~~8~~ 6
O_3	9	4	8	12	9
	~~2~~	4	5	6	

$\rightarrow$

	D_3	D_4	D_5	
O_2	$\boxed{4}$ 7	2	1	~~6~~ 2
O_3	4	8	12	9
	~~4~~	5	6	

$\rightarrow$

	D_4	D_5	
O_2	$\boxed{2}$ 2	1	~~2~~
O_3	8	12	9
	~~5~~ 3	6	

$\rightarrow$

	D_4	D_5	
O_3	$\boxed{3}$ 8	12	~~9~~ 6
	~~3~~	6	

$\rightarrow$

	D_5	
O_3	$\boxed{6}$ 12	6
	6	

So, an initial basic feasible solution by North-West corner rule is $x_{11} = 3$, $x_{12} = 1$, $x_{22} = 2$, $x_{23} = 4$, $x_{24} = 2$, $x_{34} = 3$ and $x_{35} = 6$ and the

Corresponding cost $= 3\times2 + 1\times11 + 2\times4 + 4\times7 + 2\times2 + 3\times8 + 6\times12$

$= 6 + 11 + 8 + 28 + 4 + 24 + 72$

$= 153$

Now, also we can write down the whole basic feasible solution in a table with this short-cut approach

	D_1	D_2	D_3	D_4	D_5	a_i
O_1	$\boxed{3}$ 2	$\boxed{1}$ 11	10	3	7	$\cancel{4}$ $\cancel{1}$
O_2	1	$\boxed{2}$ 4	$\boxed{4}$ 7	$\boxed{2}$ 2	1	$\cancel{8}$ $\cancel{6}$ $\cancel{2}$
O_3	3	9	4	$\boxed{3}$ 8	$\boxed{6}$ 12	$\cancel{9}$ 6
	$\cancel{3}$	$\cancel{3}$ $\cancel{2}$	$\cancel{4}$	$\cancel{8}$ $\cancel{3}$	6	

Exercises: 1. Find an initial basic feasible solution by North West corner method for the following transportation problem :

	D_1	D_2	D_3	
O_1	10	8	7	10
O_2	6	9	8	5
	5	3	7	

2. Find an initial basic feasible solution by North west corner rule for the following transportation problem

	D_1	D_2	D_3	D_4	
O_1	3	7	2	1	11
O_2	9	4	7	3	20
O_3	10	2	8	3	35
	10	5	21	30	

Is the solution non-degenerate ?

(2) Row minima method: In this method, we first consider the first row and find the minimum cost cell. Let $(1,k)$ cell be the cell in the first row with minimum cost. We allot in this cell the maximum allocation $x_{1k} = \min(a_1, b_k)$. If $a_1 < b_k$ then $x_{1k} = a_1$ and we cross out the first row and consider the remaining table and proceed in the say. Again if $a_1 > b_k$ Then $x_{1k} = b_k$ and we cross out the kth column and consider the remaining and consider the remaining table & proceed next & in the same way. If $a_1 = b_k$, then both the first row and column k is cross and we proceed with the remaining table in the same way

Example 2 Find an initial basic feasible solution by row minima method for the following transportation problem:

	D_1	D_2	D_3	D_4	D_5	
O_1	2	11	10	3	7	4
O_2	1	4	7	2	1	8
O_3	3	9	4	8	12	9
	3	3	4	5	6	

Solution: In the first row, minimum cost cell is $(1,1)$

So, $x_{11} = \min(a_1, b_1) = \min(4,3) = 3$. So the demand of the 1st destination is met and we delete the 1st column.

The remaining table is

	D_2	D_3	D_4	D_5	
O_1	11	10	3	7	1 (= 4-3)
O_2	4	7	2	1	8
O_3	9	4	8	12	9
	3	4	5	6	

In the first row of this table, the minimum cost cell is (1, 4) cell

So, $x_{14} = \min(1, 5) = 1$

Since the availability of the 1st row is exhausted, we delete the first row. The remaining table is

	D_2	D_3	D_4	D_5	
O_2	4	7	2	1	8
O_3	9	4	8	12	9
	3	4	4 $(=5-1)$	6	

Proceeding the same way, $x_{25} = \min(8, 6) = 6$. We delete destination D_5. The remaining table is

	D_2	D_3	D_4	
O_2	4	7	2	2 $(=8-6)$
O_3	9	4	8	9
	3	4	4	

Now $x_{24} = \min(2, 4) = 2$. We delete row O_2

Next table is

	D_2	D_3	D_4	
O_3	9	4	8	9
	3	4	2 $(=4-2)$	

So, $x_{33} = \min(9, 4) = 4$. We delete destination D_3

Next table is

	D_2	D_4	
O_3	9	8	5 $(=9-4)$
	3	2	

$x_{34} = \min(5, 2) = 2$. We delete destination D_4

Next table is

	D_2	
O_3	9	3 $(=5-2)$
	3	

So, $x_{32} = \cancel{9} \min(3, 3) = 3$