Answer to Question #72476, Math / Discrete Mathematics

Solve by NWCM (north-west corner method) and find optimal solution by UV method

					$Supply$
	3	1	7	4	250
	2	6	5	9	350
	8	3	3	2	400
$Demand$	150	200	300	350	

Solution.

	$v_1 = 3$	$v_2 = 1$	$v_3 = 0$	$v_4 = -1$	$Supply$
$u_1 = 0$	150	100			250
$u_2 = 5$		100	250		350
$u_3 = 3$			50	350	400
$Demand$	150	200	300	350	

$$Total\ Cost = 150 \cdot 3 + 100 \cdot 1 + 100 \cdot 6 + 250 \cdot 5 + 50 \cdot 3 + 350 \cdot 2 = 3250$$

$$c_{ij} = u_i + v_j\ for\ occupied\ cells$$

The reduced costs for unoccupied cells:

$$reduced\ cost = c_{ij} - u_i - v_j$$

$$c_{13} = 7;\ c_{14} = 4 + 1 = 5;\ c_{21} = 2 - 5 - 3 = -6$$

$$c_{24} = 9 - 5 + 1 = 5;\ c_{31} = 8 - 3 - 3 = 2;\ c_{32} = 3 - 3 - 1 = -1$$

UV method:

	$v_1 = 3$	$v_2 = 1$	$v_3 = 0$	$v_4 = -1$	$Supply$
$u_1 = 0$	$3(-)$	1	7	$5(+)$	250
$u_2 = 5$	$-6\ (+)$	$6(-)$	5	5	350
$u_3 = 3$	2	$-1(+)$	3	$2\ (-)$	400
$Demand$	150	200	300	350	

The closed path: cells

$$(2,1), (1,1), (1,2), (1,3), (1,4), (2,4), (3,4), (3,3), (3,2), (2,2), (2,1)$$

The smallest value with a negative position on the closed path is 2.
It indicates the number of units that can be shipped to the entering cell. Now we add this quantity to all the cells on the corner points of the closed path marked with plus signs and subtract it from those cells marked with minus signs.

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					$Supply$
	1	1	7	7	250
	2	4	5	5	350
	2	1	3	0	400
$Demand$	150	200	300	350	

Since all the current reduced costs are non–negative, this is the optimal solution. The minimum cost is:

$$150 \cdot 1 + 100 \cdot 1 + 100 \cdot 4 + 250 \cdot 5 + 50 \cdot 3 = 2050$$

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