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Soal Latihan Transportasi

1.

dari \ ke	Gudang A (G_1)	Gudang B (G_2)	Gudang C (G_3)	Kapasitas pabrik
Pabrik W (P_1)	Rp 20 x_{11}	Rp 5 x_{12}	Rp 8 x_{13}	90
Pabrik H (P_2)	Rp 15 x_{21}	Rp 20 x_{22}	Rp 10 x_{23}	60
Pabrik P (P_3)	Rp 25 x_{31}	Rp 10 x_{32}	Rp 19 x_{33}	50
Kebutuhan	50	110	40	200

Biaya pengiriman minimumnya ?

Jawab

$Z_{min} = 20X_{11} + 5X_{12} + 8X_{13} + 15X_{21} + 20X_{22} + 10X_{23} + 25X_{31} + 10X_{32} + 19X_{33}$

Dengan Kendala :

$X_{11} + X_{12} + X_{13} = 90$ (suplai dari P_1)

$X_{21} + X_{22} + X_{23} = 60$ (suplai dari P_2)

$X_{31} + X_{32} + X_{33} = 50$ (suplai dari P_3)

$X_{11} + X_{21} + X_{31} = 50$ (permintaan dari G_1)

$X_{12} + X_{22} + X_{32} = 110$ (permintaan dari G_2)

$X_{13} + X_{23} + X_{33} = 40$ (permintaan dari G_3)

$X_{ij} \geq 0$,

$i = 1, 2, 3$; $j = 1, 2, 3$.

Tabel Transportasi

	A	B	C	Suplai
P_1	X_{11} [20]	X_{12} [5]	X_{13} [8]	90
P_2	X_{21} [15]	X_{22} [20]	X_{23} [10]	60
P_3	X_{31} [25]	X_{32} [10]	X_{33} [19]	50
Permintaan	50	110	40	200

Model transportasi berimbang terbukti, yaitu :

$\sum_{i=1}^{m} a_i = \sum_{j=1}^{n} b_j \Rightarrow a_1 + a_2 + a_3 = b_1 + b_2 + b_3$

$90 + 60 + 50 = 50 + 110 + 40$

$200 = 200$

★ METODE NEW-CORNER ★

	A	B	C	Suplai
P_1	50 [20]	40 [5]		90
P_2		60 [20]		60
P_3		10 [10]	40 [19]	50
Permintaan	50	110	40	200

Sel Baris nya : $P_1 - A$ X_{11}

$P_1 - B$ X_{12}

$P_2 - B$ X_{22}

$P_3 - B$ X_{32}

$P_3 - C$ X_{33}

$(m+n)-1 = (3+3)-1$

$= 5$

Sesuai dengan ketentuan.

$Z_{min} = 50X_{11} + 40X_{12} + 60X_{22} + 10X_{32} + 40X_{33}$

$= 50 \cdot 20 + 40 \cdot 5 + 60 \cdot 20 + 10 \cdot 10 + 40 \cdot 19$

$= 1000 + 200 + 1200 + 100 + 760$

$= 3.260$

PENENTUAN OPTIMASI DENGAN STEPPING STONES

Sel Buran basis	closed path (jalur tertutup)	Pengurangan biaya
$P_1 - C$	$+P_1C - P_1B + P_2B - P_3C$	$8 - 5 + 10 - 19 = -6$
$P_2 - A$	$+P_2A - P_1A + P_1B - P_2B$	$15 - 20 + 5 - 20 = -20$
$P_2 - C$	$+P_2C - P_3C + P_3B - P_2B$	$10 - 19 + 10 - 20 = -19$
$P_3 - A$	$+P_3A - P_2B + P_1B - P_1A$	$25 - 10 + 5 - 20 = 0$

Tabel awal metode new-corner belum optimum karena

$P_2 - A = -20$, $P_2 - C = -19$, $P_1 - C = -6$

METODE NEW-CORNER (1)

	A	B	C	Supplai
P_1		90 [5]		90
P_2	50 [15]	10 [20]		60
P_3		10 [10]	40 [19]	50
permintaan	50	110	40	200

sel paling negatif dipilih untuk masuk di baris ($P_2 - A$), sel yg akan keluar baris adalah $P_1 - A$ karena sel bertanda (-) dengan unit terkecil.

$Z_{min} = 15X_{21} + 5X_{12} + 20X_{22} + 10X_{32} + 19X_{33}$

$= 15(50) + 5(90) + 20(10) + 10(10) + 19(40)$

$= 2260$.

METODE STEPPING STONE (2)

Sel Buran Basis	closed path	Pengurangan
$P_1 - A$	$P_1A - P_1B + P_2B - P_2A$	$20 - 5 + 20 - 15 = 20$
$P_1 - C$	$P_1C - P_3C + P_3B - P_1B$	$8 - 19 + 10 - 5 = -6$
$P_3 - A$	$P_3A - P_2A + P_2B - P_3B$	$25 - 15 + 20 - 10 = 20$
$P_2 - C$	$P_2C - P_3C + P_3B - P_2B$	$10 - 19 + 10 - 20 = -19$

Tabel ini belum optimum karena $P_1 - C = -6$, $P_2 - C = -19$.

METODE NEW CORNER (3)

	A	B	C	Supplai
P_1		90 [5]		90
P_2	50 [15]		10 [10]	60
P_3		20 [10]	30 [19]	50
Permintaan	50	110	40	200

$Z_{min} = 15X_{21} + 5X_{12} + 10X_{32} + 10X_{23} + 19X_{33}$

$= 15(50) + 5(90) + 10(20) + 10(0) + 19(30)$

$= 2070$

* METODE STEPPING STONE (3) *

Sel Bkn Basis	closed path	Pengurangan
P_1-A	$P_1A - P_1B + P_3B - P_3C + P_2C - P_2A$	20 - 5 + 10 - 19 + 10 - 15 = 1
P_3-A	$P_3A - P_3C + P_2C - P_2A$	25 - 19 + 10 - 15 = 1
P_2-B	$P_2B - P_2C + P_3C - P_3B$	20 - 10 + 19 - 10 = 19
P_1-C	$P_1C - P_3C + P_3B - P_1B$	8 - 19 + 10 - 5 = -6

Tabel ini belum optimum karena P_1-C = -6

* METODE NEW CORNER (4) *

	A	B	C	Supplai
P_1		60 E	30 B	90
P_2	50 1C		10 10	60
P_3		50 10		50
Permintaan	50	110	40	200

$Z\ min = 50X_{21} + 60X_{12} + 50X_{32} + 30X_{13} + 10X_{23}$

$= 50(15) + 60(5) + 50(10) + 30(8) + 10(10)$

$= 1890.$

* METODE STEPPING STONE (4) *

Sel Bkn Baris	closed path	Pengurangan
P_1-A	$P_1A - P_1C + P_2C - P_2A$	20 - 8 + 10 - 15 = 7
P_3-A	$P_3A - P_2A + P_2C - P_1C + P_1B - P_3B$	25 - 15 + 10 - 8 + 5 - 10 = 7
P_2-B	$P_2B - P_2C + P_1C - P_1B$	20 - 10 + 8 - 5 = 13
P_3-C	$P_3C - P_1C + P_1B - P_3B$	18 - 8 + 5 - 10 = 6

Optimasi stepping stone (4) tidak ada nilai minus (-), maka nilai pada metode new comer (4) telah menunjukkan biaya alokasi pengiriman minimum yaitu 1.890

(2)

Produksi pabrik perbulan: $P_1 = 50$, $P_2 = 50$, $P_3 = 45$

Permintaan perbulan: Sby = 55, mlg = 30, DIY = 60

Tabel Transportasi

	Surabaya (D_1)	Malang (D_2)	DIY (D_3)	
P_1	X_{11} [8]	X_{12} [10]	X_{13} [8]	50
P_2	X_{21} [15]	X_{22} [15]	X_{23} [20]	50
P_3	X_{31} [5]	X_{32} [12]	X_{33} [10]	45
	55	30	60	145

$Z\text{min} = 8X_{11} + 10X_{12} + 8X_{13} + 15X_{21} + 15X_{22} + 20X_{23} + 5X_{31} + 12X_{32} + 10X_{33}$

Dengan kendala :

$X_{11} + X_{12} + X_{13} = 50$ (suplai dari P_1)

$X_{21} + X_{22} + X_{23} = 50$ (suplai dari P_2)

$X_{31} + X_{32} + X_{33} = 45$ (suplai dari P_3)

$X_{11} + X_{21} + X_{31} = 55$ (Permintaan dari D_1)

$X_{12} + X_{22} + X_{32} = 30$ (Permintaan dari D_2)

$X_{13} + X_{23} + X_{33} = 60$ (Permintaan dari D_3)

* METODE NEW-CORNER *

	A	B	C	
P_1	50 [8]			50
P_2	5 [15]	30 [15]	15 [20]	50
P_3			45 [10]	45
	55	30	60	145

sel basisnya : P_1-A (X_{11}), P_2-A (X_{21}), P_2-B (X_{22}), P_2-C (X_{23}), P_3-C (X_{33})

Ada 5, sesuai dengan aturan $(m+n) - 1 = (3+3) - 1 = 5$

$Z\text{min} = 50 \cdot X_{11} + 5 \cdot X_{21} + 30 \cdot X_{22} + 15 \cdot X_{23} + 45 X_{33}$

$= 50(8) + 5(15) + 30(15) + 15(20) + 45(10)$

$= 400 + 75 + 450 + 300 + 450$

$= 1.675$

* METODE STEPPING STONE *

Sel Bukan Basis	Closed Path	Pengurangan
P_3 - A	$P_2A - P_2A + P_2C - P_3C$	5 - 15 + 20 - 10 = 0
P_1 - B	$P_1B - P_2B + P_2A - P_1A$	10 - 15 + 15 - 8 = 2
P_3 - B	$P_3B - P_2B + P_2C - P_3C$	12 - 15 + 20 - 10 = 7
P_1 - C	$P_1C - P_2C + P_2A - P_1A$	8 - 20 + 15 - 8 = -5

Tabel tersebut belum optimal karena $P_1 - C = -5$

* METODE NEW CORNER (2) *

	A	B	C	Supplai
P_1	35 [8]		15 [8]	50
P_2	20 [15]	30 [15]		50
P_3			45 [10]	45
	55	30	60	145

$Z\ min = 35X_{11} + 20X_{21} + 30X_{22} + 15X_{13} + 45X_{33}$

$= 35(8) + 20(15) + 30(15) + 15(8) + 45(10)$

$= 280 + 300 + 450 + 120 + 450$

$= 1.600$

* METODE STEPING STONES (2) *

Sel Bukan Basis	Closed path	Pengurangan
$P_1 - B$	$P_1B - P_2B + P_2A - P_1A$	$10 - 15 + 15 - 8 = 2$
$P_2 - C$	$P_2C - P_1C + P_1A - P_2A$	$20 - 8 + 8 - 15 = 5$
$P_3 - A$	$P_3A - P_3C + P_1C - P_1A$	$5 - 10 + 8 - 8 = -5$
$P_3 - B$	$P_3B - P_2B + P_2A - P_1A + P_1C - P_3C$	$12 - 15 + 15 - 8 + 8 - 10 = 2$

Tabel tersebut belum optimal karena $P_3 - A = -5$

* METODE NEW CORNER (3) *

	A	B	C	Supplai
P_1			50 [8]	50
P_2	20 [15]	30 [15]		50
P_3	35 [5]		10 [10]	45
	55	30	60	

$Z\ min = 20X_{21} + 35X_{31} + 30X_{22} + 50X_{13} + 10X_{33}$

$= 20(15) + 35(5) + 30(15) + 50(8) + 10(10)$

$= 300 + 175 + 450 + 400 + 100$

$= 1.425$

* METODE STEPING STONES (3)

Sel Bkn Basis	Closed path	Pengurangan
$P_1 - A$	$P_1A - P_1C + P_3C - P_3A$	$8 - 8 + 10 - 5 = 5$
$P_1 - B$	$P_1B - P_2B + P_2A - P_1A$	$10 - 15 + 15 - 8 = 2$
$P_3 - B$	$P_3B - P_3A + P_2A - P_2B$	$12 - 5 + 15 - 15 = 7$
$P_2 - C$	$P_2C - P_3C + P_3A - P_2A$	$20 - 10 + 5 - 15 = 0$

optimasi stepping stones (3) tidak menunjukkan hasil minus (-), maka nilai pada metode new corner (3) telah menunjukkan biaya pengiriman minimum, yaitu 1425.