

## Lampiran 1

Nilai-nilai perubahan ongkos transportasi dari setiap variabel non basis

$c'_{ij}$	Perhitungan perubahan ongkos transportasi	Jml	$c'_{ij}$ sama
$c'_{12}$	$c_{12} - c_{14} + c_{34} - c_{32}$ 2.3 - 1.7 + 1 - 1.6	-0.05	$c'_{34}$
$c'_{13}$	$c_{13} - c_{14} + c_{74} - c_{73}$ 2.2 - 1.7 + 0.95 - 0.25	1.2	$c'_{74}$
$c'_{15}$	$c_{15} - c_{14} + c_{134} - c_{135}$ 5.9 - 1.7 + 1.15 - 3.65	1.7	$c'_{134}$
$c'_{22}$	$c_{22} - c_{26} + c_{36} - c_{32}$ 0 - 0.2 + 1.75 - 1.65	-0.1	$c'_{36}$
$c'_{23}$	$c_{23} - c_{26} + c_{76} - c_{73}$ 1.65 - 0.2 + 2 - 0.25	3.2	$c'_{76}$
$c'_{33}$	$c_{33} - c_{32} + c_{12} - c_{14} + c_{74} - c_{73}$ 0 - 1.65 + 2.3 - 1.7 + 0.95 - 0.25	-0.35	$c'_{74}$ $c'_{12}$
$c'_{37}$	$c_{37} - c_{32} + c_{62} - c_{610} + c_{1010} - c_{1014} + c_{1614} - c_{1613} +$ $c_{1213} - c_{1211} + c_{1111} - c_{117}$ 0.25 - 1.65 + 0.2 - 1.4 + 0 - 1.8 + 2.8 - 1.7 + 0.7 - 0.05 + 0 - 0.85	-3.5	$c'_{62}$ $c'_{1010}$ $c'_{1614}$ $c'_{1213}$ $c'_{1111}$
$c'_{43}$	$c_{43} - c_{412} + c_{1212} - c_{1211} + c_{711} - c_{73}$ 1 - 0.65 + 0 - 0.05 + 0.85 - 0.25	0.9	$c'_{1212}$ $c'_{711}$
$c'_{44}$	$c_{44} - c_{412} + c_{1312} - c_{135} + c_{15} - c_{14}$ 0 - 0.65 + 0.7 - 3.65 + 5.9 - 1.7	0.6	$c'_{1312}$ $c'_{15}$
$c'_{45}$	$c_{45} - c_{412} + c_{1312} - c_{135}$ 4.3 - 0.65 + 0.7 - 3.65	0.7	$c'_{1312}$
$c'_{47}$	$c_{47} - c_{412} + c_{1112} - c_{117}$ 0.95 - 0.65 + 0.05 - 0.85	-0.5	$c'_{1112}$
$c'_{411}$	$c_{411} - c_{412} + c_{1212} - c_{1211}$ 0.8 - 0.65 + 0 - 0.05	0.1	$c'_{1212}$
$c'_{413}$	$c_{413} - c_{412} + c_{1612} - c_{1613}$ 1.15 - 0.65 + 1.2 - 1.7	0	$c'_{1612}$
$c'_{54}$	$c_{54} - c_{58} + c_{98} - c_{99} + c_{139} - c_{135} + c_{15} - c_{14}$ 4.3 - 1.3 + 0.3 - 0 + 4 - 3.65 + 5.9 - 1.7	7.85	$c'_{98}$ $c'_{139}$ $c'_{15}$
$c'_{55}$	$c_{55} - c_{58} + c_{88} - c_{89} + c_{139} - c_{135}$ 0 - 1.3 + 0 - 0.3 + 4 - 3.65	-1.25	$c'_{88}$ $c'_{139}$

$C'_{513}$	$C_{513} - C_{58} + C_{98} - C_{99} + C_{139} - C_{135} + C_{45} - C_{412} + C_{1612} - C_{1613}$		$C'_{98}$ $C'_{139}$
	$3.65 - 1.3 + 0.3 - 0 + 4 - 3.65 + 4.3 - 0.65 + 1.2 - 1.7$	6.15	$C'_{45}$ $C'_{1612}$
$C'_{63}$	$C_{63} - C_{610} + C_{1010} - C_{1014} + C_{714} - C_{73}$		$C'_{1010}$ $C'_{714}$
	$1.75 - 1.4 + 0 - 1.8 + 2 - 0.25$	0.3	
$C'_{66}$	$C_{66} - C_{610} + C_{1010} - C_{1014} + C_{1414} - C_{1415} + C_{1615} - C_{1613} + C_{1213} - C_{1211} + C_{711} - C_{73} + C_{23} - C_{26}$		$C'_{1010}$ $C'_{1414}$ $C'_{1615}$
	$0 - 1.4 + 0 - 1.8 + 0 - 0.8 + 1.9 - 1.7 + 0.7 - 0.05 + 0.85 - 0.25 + 1.65 - 0.2$	-1.1	$C'_{1213}$ $C'_{711}$ $C'_{23}$
$C'_{67}$	$C_{67} - C_{610} + C_{1410} - C_{1415} + C_{1615} - C_{1613} + C_{1213} - C_{1211} + C_{1111} - C_{117}$		$C'_{1410}$ $C'_{1615}$ $C'_{1213}$ $C'_{1111}$
	$2 - 1.4 + 1.8 - 0.8 + 1.9 - 1.7 + 0.7 - 0.05 + 0 - 0.85$	1.6	
$C'_{614}$	$C_{614} - C_{610} + C_{1010} + C_{1014}$		$C'_{1010}$
	$1.1 - 1.4 + 0 - 1.8$	-2.1	
$C'_{77}$	$C_{77} - C_{73} + C_{13} - C_{14} + C_{114} - C_{117}$		$C'_{114}$ $C'_{13}$
	$0 - 0.25 + 2.2 - 1.7 + 0.8 - 0.85$	0.2	
$C'_{716}$	$C_{716} - C_{73} + C_{63} - C_{610} + C_{1010} - C_{1014} + C_{1514} - C_{1516}$		$C'_{1514}$ $C'_{63}$ $C'_{1010}$
	$1.7 - 0.25 + 1.75 - 1.4 + 0 - 1.8 + 0.8 - 1.9$	-1.1	
$C'_{85}$	$C_{85} - C_{89} + C_{139} - C_{135}$		$C'_{139}$
	$1.3 - 0.3 + 4 - 3.65$	1.35	
$C'_{913}$	$C_{913} - C_{99} + C_{139} - C_{135} + C_{45} - C_{412} + C_{1612} - C_{1613}$		$C'_{1612}$ $C'_{139}$ $C'_{45}$
	$4 - 0 + 4 - 3.65 + 4.3 - 0.65 + 1.2 - 1.7$	7.5	
$C'_{106}$	$C_{106} - C_{1014} + C_{714} - C_{73} + C_{23} - C_{26}$		$C'_{714}$ $C'_{23}$
	$1.4 - 1.8 + 2 - 0.25 + 1.65 - 0.2$	2.8	
$C'_{124}$	$C_{124} - C_{1211} + C_{711} - C_{73} + C_{13} - C_{14}$		$C'_{711}$ $C'_{13}$
	$0.65 - 0.05 + 0.85 - 0.25 + 2.2 - 1.7$	1.7	
$C'_{1216}$	$C_{1216} - C_{1211} + C_{1111} - C_{117} + C_{147} - C_{1415} + C_{1515} - C_{1516}$		$C'_{147}$ $C'_{1515}$ $C'_{1111}$
	$1.2 - 0.05 + 0 - 0.85 + 2 - 0.8 + 0 - 1.9$	-0.4	
$C'_{1313}$	$C_{1313} - C_{135} + C_{45} - C_{412} + C_{1612} - C_{1613}$		$C'_{1612}$ $C'_{45}$
	$0 - 3.65 + 4.3 - 0.65 + 1.2 - 1.7$	-0.5	
$C'_{1316}$	$C_{1316} - C_{135} + C_{15} - C_{14} + C_{34} - C_{32} + C_{22} - C_{26} + C_{146} - C_{1415} + C_{1515} - C_{1516}$		$C'_{146}$ $C'_{1515}$ $C'_{34}$ $C'_{22}$ $C'_{15}$
	$1.7 - 3.65 + 5.9 - 1.7 + 1 - 1.65 + 0 - 0.2 + 1.1 - 0.8 + 0 - 1.9$	-0.2	

$c'_{1416}$	$c_{1416} - c_{1415} + c_{1515} - c_{1516}$ 2.8 - 0.8 + 0 - 1.9	0.1	$c'_{1515}$
$c'_{167}$	$c_{167} - c_{1613} + c_{1213} - c_{1211} + c_{1111} - c_{117}$ 1.7 - 1.7 + 0.7 - 0.05 + 0 - 0.85	-0.2	$c'_{1213}$ $c'_{1111}$
$c'_{1616}$	$c_{1616} - c_{1613} + c_{413} - c_{412} + c_{1212} - c_{1211} + c_{1111} - c_{117}$ + $c_{147} - c_{1415} + c_{1515} - c_{1516}$		$c'_{1515}$ $c'_{147}$ $c'_{1212}$
	0 - 1.7 + 1.15 - 0.65 + 0 - 0.05 + 0 - 0.85 + 2 - 0.8 + 0 - 1.9	-2.8	$c'_{413}$ $c'_{1111}$



## Lampiran 2

Rute yang dihasilkan apabila terdapat perubahan ongkos transportasi untuk  $c'_{ij}$  yang bernilai negatif.

Nilai $c'_{ij}$	Rute yang dihasilkan dari node-node yang dilalui	Node yang tidak dilalui
-3.5	1-4-12-13-5-8-9	10, 11
	6-2-3-7-3	
	14-15-16-14	
-2.8	1-4-13-5-8-9	11, 12, 15, 6
	2-6-10-14-7-3-2	
-2.1	1-4-12-11-7-3-2-6-14-15-16-13-5-8-9	10
-1.25	1-4-12-11-7-3-2-6-10-14-15-16-13-9	5, 8
-1.1	1-4-12-13-5-8-9	6, 10, 14
	11-7-11	
	3-2-3	
	15-16-15	
-1.1	1-4-12-11-7-16-13-5-8-9	10
	3-2-6-3	
	14-15-14	
-0.5	1-4-7-3-2-6-10-14-15-16-13-5-8-9	-
	12-11-12	
-0.5	1-4-5-8-9	13
	12-11-7-3-2-6-10-14-15-16-12	
-0.4	1-4-12-16-13-5-8-9	11, 15
	7-3-2-6-10-14-7	
-0.35	1-2-6-10-14-15-16-13-5-8-9	3
	4-12-11-7-4	
-0.2	1-5-8-9	2, 15
	4-12-11-7-3-4	
	6-10-14-6	
	16-13-16	
-0.2	1-4-12-13-5-8-9	11
	7-3-2-6-10-14-15-16-7	
-0.1	1-4-12-11-7-3-6-10-14-15-16-13-5-8-9	2