ANALISIS GAYA STATIS RANGKAIAN EMPAT-BATANG

Link 4

$F_{14X} + F_{4X} + F_{34X} = 0$ ..... $\Sigma Fx=0$

$F_{14Y} + F_{4Y} + F_{34Y} = 0$ ..... $\Sigma Fy=0$

$F_{34Y}.c.\cos\Theta_4 - F_{34X}.c.\sin\Theta_4 + F_{4Y}.c'.\cos\Theta_4 - F_{4X}.c'.\sin\Theta_4 + C_4 = 0$... $\Sigma M=0$

Link 3

$F_{23X} + F_{3X} + F_{43X} = 0$..... $\Sigma Fx=0$

$F_{23Y} + F_{3Y} + F_{43Y} = 0$..... $\Sigma Fy=0$

$F_{43Y}.b.\cos\Theta_3 - F_{43X}.b.\sin\Theta_3 + F_{3Y}.b'.\cos\Theta_3 - F_{3X}.b'.\sin\Theta_3 + C_3 = 0$

$F_{43X} = - F_{34X}$
$F_{43Y} = - F_{34Y}$

Dengan menggantikan hubungan ini ke dalam persamaan keseimbangan link 3, diperoleh:

$F_{23X} + F_{3X} - F_{34X} = 0$

$F_{23Y} + F_{3Y} - F_{34Y} = 0$

$- F_{34Y}.b.\cos\Theta_3 + F_{34X}.b.\sin\Theta_3 + F_{3Y}.b'.\cos\Theta_3 - F_{3X}.b'.\sin\Theta_3 + C_3 = 0$

Penyelesaian masalah ini disederhanakan dengan menyusun persamaan-persamaan tersebut menjadi:

$a_{11} F_{34X} + a_{12} F_{34Y} = b_1$

$a_{21} F_{34X} + a_{22} F_{34Y} = b_2$

$$\begin{bmatrix} a11 & a12 \\ a21 & a22 \end{bmatrix} \quad \begin{bmatrix} F_{34X} \\ F_{34Y} \end{bmatrix}$$

dengan:

$a_{11} = c.\sin\Theta_4$

$a_{12} = - c.\cos\Theta_4$

$a_{21} = b.\sin\Theta_3$

$a_{22} = - b.\cos\Theta_3$

$b_1 = F_{4X}.c'.\sin\Theta_4 - F_{4Y}.c'.\cos\Theta_4 - C_4$

$b_2 = F_{3X}.b'.\sin\Theta_3 - F_{3Y}.b'.\cos\Theta_3 - C_3$

sehingga diperoleh:

$$F_{34X} = \frac{a_{22}b_1 - a_{12}b_2}{a_{11}a_{22} - a_{12}a_{21}}$$

$$F_{34Y} = \frac{a_{11}b_2 - a_{21}b_1}{a_{11}a_{22} - a_{12}a_{21}}$$

$F_{14X} = - F_{4X} - F_{34X}$

$F_{14Y} = - F_{4Y} - F_{34Y}$

$F_{23X} = - F_{43X} - F_{3X} = F_{34X} - F_{3X}$

$F_{23Y} = - F_{43Y} - F_{3Y} = F_{34Y} - F_{3Y}$

Link 2

$F_{12X} + F_{2X} + F_{32X} = 0$

$F_{12Y} + F_{2Y} + F_{32Y} = 0$

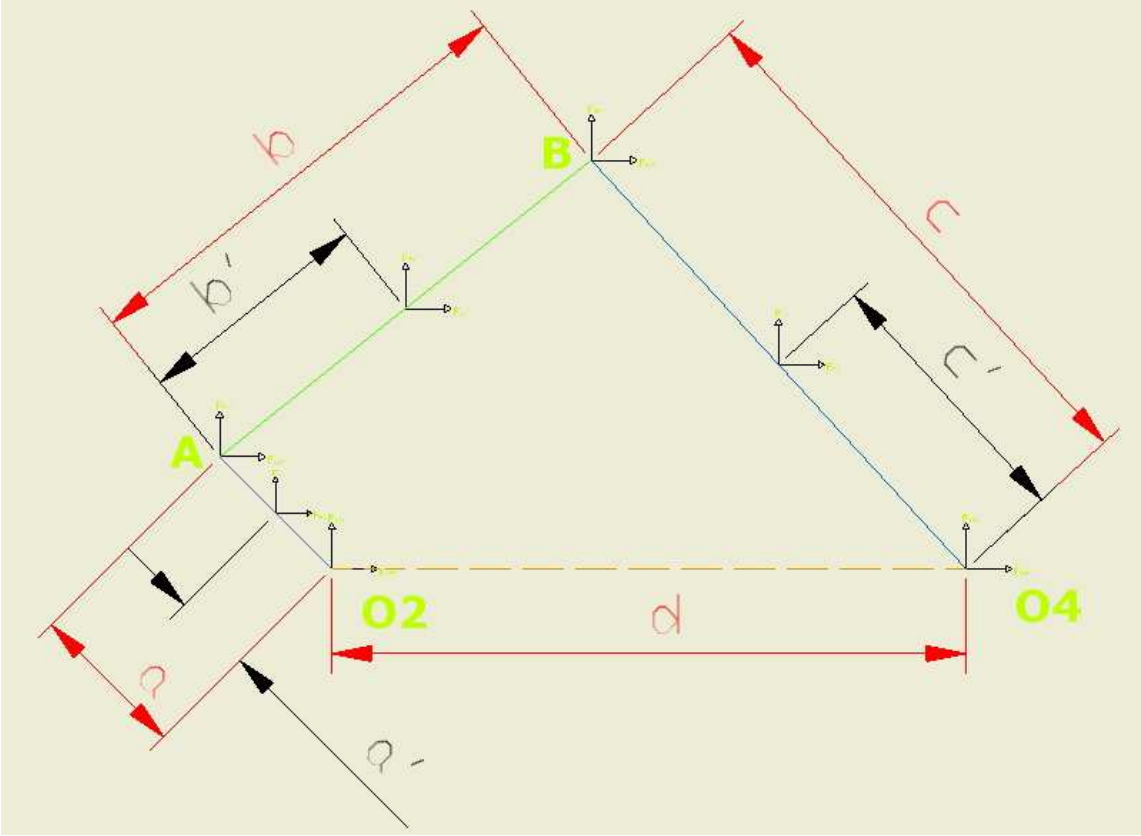
$T + F_{32Y}.a.\cos\Theta_2 - F_{32X}.a.\sin\Theta_2 + F_{2Y}.a'.\cos\Theta_2 - F_{2X}.a'.\sin\Theta_2 + C_2 = 0$

Dengan mengganti $F_{32Y} = - F_{23Y}$ dan $F_{32X} = - F_{23X}$ dan menyusun suku-sukunya, kita peroleh F_{12X}, F_{12Y}, **dan T:**

$F_{12X} = F_{23X} - F_{2X}$

$F_{12Y} = F_{23Y} - F_{2Y}$

$T = F_{23Y}.a.\cos\Theta_2 - F_{23X}.a.\sin\Theta_2 - F_{2Y}.a'.\cos\Theta_2 + F_{2X}.a'.\sin\Theta_2 - C_2$


b
b'
B
c
c'
A
O2
d
O4
a
a'