

{AB → 0.18, BC → 0.7, h → 0.01, d → 0.01, hSlider → 0.02, wSlider → 0.05, ro → 8000,  
g → 9.807, fe → 1000., phi[t] → 0.785398, phi'[t] → 41.8879, phi''[t] → 0}

AC1={0.0636396, 0.0636396, 0}[m]; AB={0.127279, 0.127279, 0}[m]

AC2={0.471445, 0.0636396, 0}[m]; AC3=AC={0.815611, 0, 0}[m]

aC1={-111.662, -111.662, 0}[m/s<sup>2</sup>]; alpha1={0, 0, 0}[rad/s<sup>2</sup>]

aC2={-224.03, -111.662, 0}[m/s<sup>2</sup>]; alpha2={0, 0, 313.349}[rad/s<sup>2</sup>]

aC3=aC{-224.736, 0, 0}[m/s<sup>2</sup>]; alpha3={0, 0, 0}[rad/s<sup>2</sup>]

Fext={1000., 0, 0}[N]

m1=0.144[kg]; m2=0.56[kg]; m3=0.08[kg]

IC1=0.00039[kg m<sup>2</sup>]; IC2=0.0228713[kg m<sup>2</sup>]; IC3=0.0000193333[kg m<sup>2</sup>]

F1=Fin1+G1=-m1\*aC1-m1\*g={16.0793, 14.6671, 0}[N]; M1=Min1=0 [N m]

F2=Fin2+G2=-m2\*aC2-m2\*g={125.457, 57.0387, 0}[N]

M2=Min2=-IC2 alpha2={0, 0, -7.16671}[N m]

F3=Fin3+G3=-m3\*aC -m3\*g={17.9788, -0.78456, 0}[N]; M3=Min3=0 [N m]

LINK 1

Sum F for link 1: (Fin1+G)+F21+F01=0 <=> F1+F21+F01=0

(x): 16.0793 + F01x + F21x = 0 (1); (y): 14.6671 + F01y + F21y = 0 (2)

Sum M for 1 wrt C1: C1B x F21 + C1A x F01 + M1 + Mm = 0

C1B={0.0636396, 0.0636396, 0}[m]; C1A={-0.0636396, -0.0636396, 0}[m]

(z): 0.0636396 F01x - 0.0636396 F01y - 0.0636396 F21x + 0.0636396 F21y + M = 0 (3)

LINK 2

Sum F for link 2: (Fin2+G2)+F32+F12=0 <=> F2+F32+F12=0 (F12=-F21)

(x): 125.457 - F21x + F32x = 0 (4); (y): 57.0387 - F21y + F32y = 0 (5)

Sum M for link 2 wrt C2: C2B x F12 + C2C x F32 + M2 = 0

C2B={-0.344166, 0.0636396, 0}[m]; C2C={0.344166, -0.0636396, 0}[m]

(z): -7.16671 + 0.0636396 F21x + 0.344166 F21y + 0.0636396 F32x + 0.344166 F32y = 0 (6)

LINK 3

F03 perpendicular to x-axis: F03={0, F03y, 0}

Sum F for link 3: (Fin3+G3)+F03+F23+Fe=0 <=> F3+F03+F23+Fe=0 (F23=-F32)

(x): 1017.98 - F32x = 0 (7); (y): -0.78456 + F03y - F32y = 0 (8)

Sum M for link 3 wrt C3: CQxF03+M3=0=>CQ=0, F03 acts @ C

From Eqs. (1)-(8) => {F01x, F01y, F21x, F21y, F32x, F32y, F03y, M}

$$\mathbf{F01} = \{\mathbf{F01x}, \mathbf{F01y}, 0\} = \{-1159.51, 146.235, 0\} \text{ [N]}$$

$$\mathbf{F21} = \{\mathbf{F21x}, \mathbf{F21y}, 0\} = \{1143.44, -160.902, 0\} \text{ [N]}$$

$$\mathbf{F32} = \{\mathbf{F32x}, \mathbf{F32y}, 0\} = \{1017.98, -217.941, 0\} \text{ [N]}$$

$$\mathbf{F03} = \{0, \mathbf{F03y}, 0\} = \{0, -217.156, 0\} \text{ [N]}$$

$$\mathbf{Mmotor} = \{0, 0, \mathbf{Mm}\} = \{0, 0, 166.105\} \text{ [Nm]}$$