

restart :  
 with(DETools) :  
 with(LinearAlgebra) :

## ▼ Project 4 Maple Code for Statics

### ▼ Enter Knowns

$x_1 := 1.5625 :$   
 $x_2 := 2.375 :$   
 $x_3 := 3.125 :$   
 $x_4 := 0.6875 :$   
 $\phi_2 := 6 :$   
 $\phi_3 := 2 :$   
 $\phi_4 := 6 :$   
 $F := 900 :$   
 $L_1 := 2 :$

### ▼ Basic Level (No Radial Gear Forces)

$$\text{Equation}_1 := \frac{-\phi_4 \cdot G_{T4}}{2} + L_1 \cdot F = 0 :$$

$$\text{Equation}_2 := -x_1 \cdot G_{T4} - E_z \cdot x_2 = 0 :$$

$$\text{Equation}_3 := x_1 \cdot G_{R4} + E_y \cdot x_2 - F \cdot x_3 = 0 :$$

$$\text{Equation}_4 := H_y + G_{R4} + E_y - F = 0 :$$

$$\text{Equation}_5 := H_z + G_{T4} + E_z = 0 :$$

$$\text{Equation}_6 := \frac{-\phi_3 \cdot G_{T4}}{2} + \frac{\phi_2 \cdot G_{T2}}{2} = 0 :$$

$$\text{Equation}_7 := +x_1 \cdot G_{T4} + x_4 \cdot G_{T2} - x_2 \cdot D_z = 0 :$$

$$\text{Equation}_8 := -x_1 \cdot G_{R4} + x_4 \cdot G_{R2} + x_2 \cdot D_y = 0 :$$

$$\text{Equation}_9 := A_y + G_{R2} - G_{R4} + D_y = 0 :$$

$$\text{Equation}_{10} := A_z - G_{T2} - G_{T4} + D_z = 0 :$$

$$\text{Equation}_{11} := G_{R4} = 0 :$$

$$\text{Equation}_{12} := G_{R2} = 0 :$$

$\text{dsolve}(\{ \text{Equation}_1, \text{Equation}_2, \text{Equation}_3, \text{Equation}_4, \text{Equation}_5, \text{Equation}_6, \text{Equation}_7, \text{Equation}_8, \\ \text{Equation}_9, \text{Equation}_{10}, \text{Equation}_{11}, \text{Equation}_{12} \}, \{ G_{T4}, E_z, G_{R4}, E_y, H_y, H_z, G_{T2}, D_z, G_{R2}, D_y, A_y, \\ A_z \})$

$$\left\{ A_y = 0, A_z = \frac{6600}{19}, D_y = 0, D_z = \frac{8600}{19}, E_y = \frac{22500}{19}, E_z = -\frac{7500}{19}, G_{R2} = 0, G_{R4} = 0, G_{T2} \right. \quad (1.2.1)$$

$$= 200, G_{T4} = 600, H_y = -\frac{5400}{19}, H_z = -\frac{3900}{19} \}$$

## Medium Level (Include Radial Gear Forces)

$$Equation_1 := \frac{-\phi_4 \cdot G_{T4}}{2} + L_1 \cdot F = 0 :$$

$$Equation_2 := -x_1 \cdot G_{T4} - E_z \cdot x_2 = 0 :$$

$$Equation_3 := x_1 \cdot G_{R4} + E_y \cdot x_2 - F \cdot x_3 = 0 :$$

$$Equation_4 := H_y + G_{R4} + E_y - F = 0 :$$

$$Equation_5 := H_z + G_{T4} + E_z = 0 :$$

$$Equation_6 := \frac{-\phi_3 \cdot G_{T4}}{2} + \frac{\phi_2 \cdot G_{T2}}{2} = 0 :$$

$$Equation_7 := +x_1 \cdot G_{T4} + x_4 \cdot G_{T2} - x_2 \cdot D_z = 0 :$$

$$Equation_8 := -x_1 \cdot G_{R4} + x_4 \cdot G_{R2} + x_2 \cdot D_y = 0 :$$

$$Equation_9 := A_y + G_{R2} - G_{R4} + D_y = 0 :$$

$$Equation_{10} := A_z - G_{T2} - G_{T4} + D_z = 0 :$$

$$Equation_{11} := G_{R4} = G_{T4} \cdot \tan\left(\frac{20 \cdot \text{Pi}}{180}\right) :$$

$$Equation_{12} := G_{R2} = G_{T2} \cdot \tan\left(\frac{20 \cdot \text{Pi}}{180}\right) :$$

$$\begin{aligned} & \text{evalf}\left(\text{dsolve}\left(\{Equation_1, Equation_2, Equation_3, Equation_4, Equation_5, Equation_6, Equation_7, \right. \right. \\ & \quad \left. Equation_8, Equation_9, Equation_{10}, Equation_{11}, Equation_{12}\}, \{G_{T4}, E_z, G_{R4}, E_y, H_y, H_z, G_{T2}, D_z, \right. \\ & \quad \left. G_{R2}, D_y, A_y, A_z\}\right) \end{aligned} \quad (1.3.1)$$

$$\begin{aligned} & \{A_y = 22.98759375, A_z = 347.3684211, D_y = 122.6005000, D_z = 452.6315789, E_y \\ & \quad = 1040.538065, E_z = -394.7368421, G_{R2} = 72.79404686, G_{R4} = 218.3821406, G_{T2} \\ & \quad = 200., G_{T4} = 600., H_y = -358.9202060, H_z = -205.2631579\} \end{aligned}$$