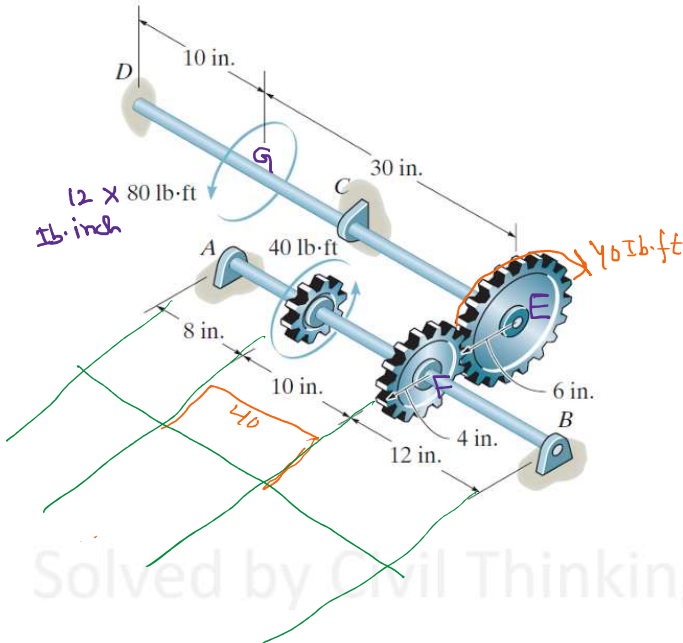


# Torsion in Shafts. Question 5-61 Solution

Saturday, 15 March, 2025 08:23 PM

•5-61. The two shafts are made of A-36 steel. Each has a diameter of 1 in., and they are supported by bearings at A, B, and C, which allow free rotation. If the support at D is fixed, determine the angle of twist of end B when the torques are applied to the assembly as shown.

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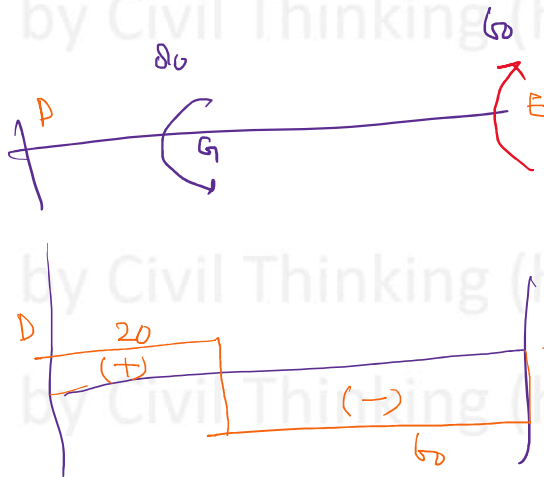


$$\theta_D = \theta_F$$

$$\theta_F \times 4 = \theta_E \times 6$$

$$\Rightarrow \theta_F = \frac{6}{4} \theta_E$$

$$\theta_E = \theta_{E/D} = \theta_{E/C} + \theta_{C/D}$$



$$\Rightarrow \theta_{ED} = \left( \frac{TL}{GJ} \right)_{EG} + \left( \frac{TL}{GJ} \right)_{GD} = \frac{1}{GJ} \left( (TL)_{EG} + (TL)_{GD} \right)$$

$$\Rightarrow \theta_{ED} = \frac{1}{11 \times 10^5 \times \frac{\pi}{2} \left( \frac{1}{2} \right)^4} \left[ (-66 \times 12 \times 30) + (20 \times 12 \times 10) \right]$$

$$\Rightarrow \theta_{ED} = -0.1778 \text{ rad/m}$$

$$\Rightarrow \theta_E = -0.1778 \text{ rad}$$

$$\Rightarrow \theta_f = \frac{6}{4} \theta_E = -0.2667 \text{ rad}$$

$$\Rightarrow \theta_f = 15.28^\circ \text{ Ans.}$$

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