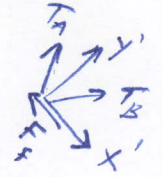
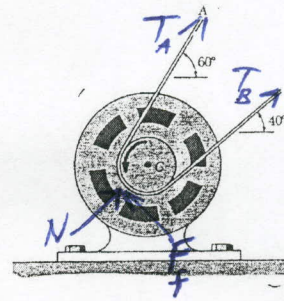


3. A flat belt is used to transmit the 25 lb-ft torque developed by an electric motor. The drum in contact with the belt has a diameter of 6 in., and the coefficient of static friction between the belt and the drum is 0.30. Determine the minimum allowable value of the tension in each part of the belt if the belt is not to slip.



$$\theta = 160^\circ, \quad \beta = \frac{160\pi}{180} \approx 2.79 \text{ rad.}$$

$$F_f = \frac{M}{d} = \frac{25 \text{ lb-ft}}{0.25 \text{ ft}} = 100 \text{ lb}$$

$$\sum F_{x'} = 0; \quad T_B \cos 80^\circ - F_f - T_A \cos 80^\circ = 0 \Rightarrow T_B \cos 80^\circ - T_B e^{\mu\beta} \cos 80^\circ = 100$$

$$T_A = T_B e^{\mu\beta}$$

$$T_B = \frac{100}{\cos 80^\circ - e^{\mu\beta} \cos 80^\circ} = \boxed{-440}$$

Answer

$T_a = 176 \text{ (lbs)}$

$T_b = 76.3 \text{ (lbs)}$