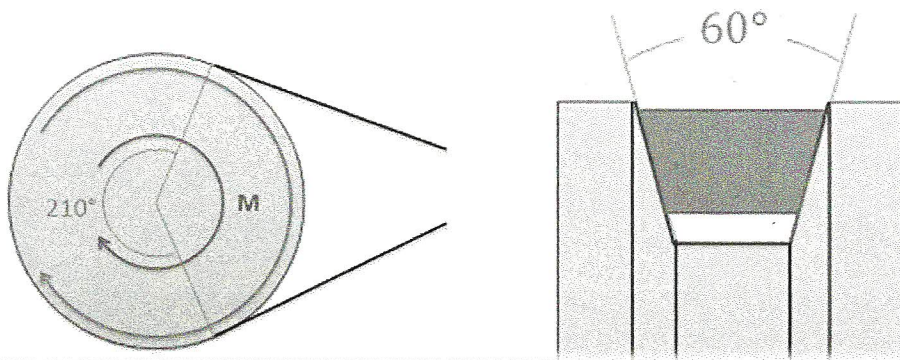## Question 2:

A V belt pulley as shown below is used to transmit a torque. If the diameter of the pulley below is 5 inches, the resting tension in the belt is 20 lbs, and the coefficient of friction between the belt material and the pulley is .4, what is the maximum torque the pulley can exert before slipping?

$$\beta = 210° = 3.665 \text{ rad}$$

$$T_{2max} = T_1 e^{(M_s \text{ enh})(\beta)}$$

$$M_s \text{ enh} = \frac{M_s}{\sin\left(\frac{\alpha}{2}\right)} = \frac{.4}{\sin(30°)} = .8$$

$$T_{2max} = 20 \text{ lbs } e^{(.8)(3.665)}$$

$$T_{2max} = 375.3 \text{ lbs}$$

$$M_{max} = (T_{2max} - T_1)(r)$$

$$M_{max} = (375.3 - 20)(2.5in)$$

$$\boxed{M_{max} = 888.3 \text{ in lbs} = 74.0 \text{ ft lbs}}$$