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Question:
A flat belt drive is required to transmit 35 kW from a pulley of 1.5 m effective diameter running at speed of 300 rpm. The angle of contact is spread over 11/24 of the circumference co-efficient of friction for the surface is 0.3. Determine the maximum tension in the belt.

Answer:

Given:

$d = 1.5$ m, $N = 300$ rpm, $\mu = 0.3$, $P = 35$ KW

$\theta = 11/24 \times 360^\circ = 165^\circ$

$\therefore \theta = 165^\circ \times \pi/180 = 2.88$ rad.

We know that velocity of belt,

$$V = \frac{\pi . d . N}{60} = \frac{\pi \times 1.5 \times 300}{60} = 23.55 \text{ m/s.}$$

$$\frac{T_1}{T_2} = e^{\mu . \theta} = e^{0.3 \times 2.88} = e^{0.864}$$

$$\therefore \frac{T_1}{T_2} = e^{0.864} \quad \text{---------- eqn. NO 1}$$

We know that Power transmitted by the belt

$$P = (T_1 - T_2) V$$

$$\therefore 35 \times 10^3 = (T_1 - T_2) 23.55$$

$$\therefore T_1 - T_2 = 1486.20 \quad \text{---------- eqn NO: 2}$$

By solving eqn 1 & 2, Max. tension in the belt is 2571. N