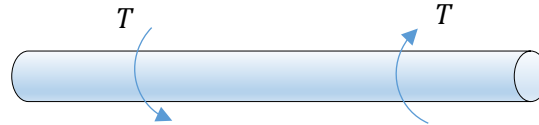


The torque  $T$  acting on a shaft is normally distributed. If the probabilities of the torques less than 150 kN·m and 200 kN·m are 0.6 and 0.7, respectively. What are the mean and standard deviation of the torque?



Solution

The torque follows a normal distribution  $T \sim N(\mu, \sigma^2)$ . The two probabilities are

$$\Pr(T < 150) = \Phi\left(\frac{150 - \mu}{\sigma}\right) = 0.6$$

$$\Pr(T < 200) = \Phi\left(\frac{200 - \mu}{\sigma}\right) = 0.7$$

Then

$$\frac{150 - \mu}{\sigma} = \Phi^{-1}(0.6) = 0.2533$$

and

$$\frac{200 - \mu}{\sigma} = \Phi^{-1}(0.7) = 0.5244$$

Solving the above two equations yields

$$\mu = 103.28 \text{ kN}\cdot\text{m}$$

$$\sigma = 184.43 \text{ kN}\cdot\text{m}$$