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**Question:**

**Two parallel shafts, connected by a crossed belt, are provided with pulleys 480 mm and 640 mm in diameters. The distance between the centre lines of the shafts is 3 m. Find by how much the length of the belt should be changed if it is desired to alter the direction of rotation of the driven shaft.**

**Answer:**

$$\begin{aligned} D_1 &= 480\text{mm} = 0.48\text{m} & R_1 &= 0.24\text{m} \\ D_2 &= 640\text{mm} = 0.64\text{m} & R_2 &= 0.32\text{m} \\ x &= 3\text{m} \end{aligned}$$

Crossed belt=

$$L = \Pi(r_1 + r_2) + 2x + \frac{(r_1 + r_2)^2}{1} \text{-----1 mark}$$

$$L = \Pi(0.24 + 0.32) + 2(3) + \frac{(0.24 + 0.32)^2}{3}$$

$$L = 7.863\text{m} \text{-----2 marks}$$

Now Rotation Alter(open belt)

$$L = \Pi(r_1 + r_2) + 2x + \frac{(r_1 - r_2)^2}{1} \text{-----1 mark}$$

$$L = \Pi(0.24 + 0.32) + 2(3) + \frac{(0.24 - 0.32)^2}{3}$$

$$L = 7.76\text{mm} \text{-----2 marks}$$

**Length of belt should be changed,**

$$L = (\text{Length of cross belt}) - (\text{length of open belt})$$
$$= 7.863 - 7.76$$

$$L = 0.103 \text{ mm} \text{-----2 marks}$$

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