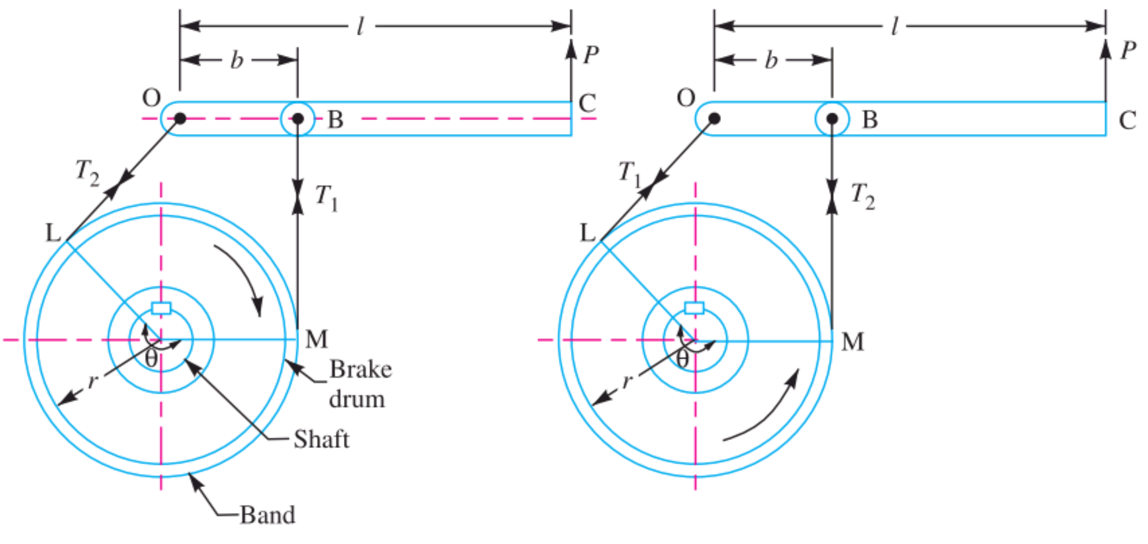
Experiment 09

AIM: To create band brake

SOFTWARE USED: Solid works 2020

THEORY: A band brake consists of a flexible band of leather, one or more ropes, or a steel lined with friction material, which embraces a part of the circumference of the drum. A band brake, as, is called a simple band brake in which one end of the band is attached to a fixed pin or fulcrum of the lever while the other end is attached to the lever at a distance b from the fulcrum. When a force P is applied to the lever at C, the lever turns about the fulcrum pin O and tightens
the band on the drum and hence the brakes are applied. The friction between the band and the drum provides the braking force. The force P on the lever at C may be determined as discussed below:



(a) Clockwise rotation of drum. (b) Anticlockwise rotation of drum.

Simple Band Brake

Let
T_1 = Tension in the tight side of the band,
T_2 = Tension in the slack side of the band,
θ = Angle of lap (or embrace) of the band on the drum,
μ = Coefficient of friction between the band and the drum,
r = Radius of the drum,
t = Thickness of the band, and

re = Effective radius of the drum = r + t /2.

We know that limiting ratio of the tensions is given by the relation,

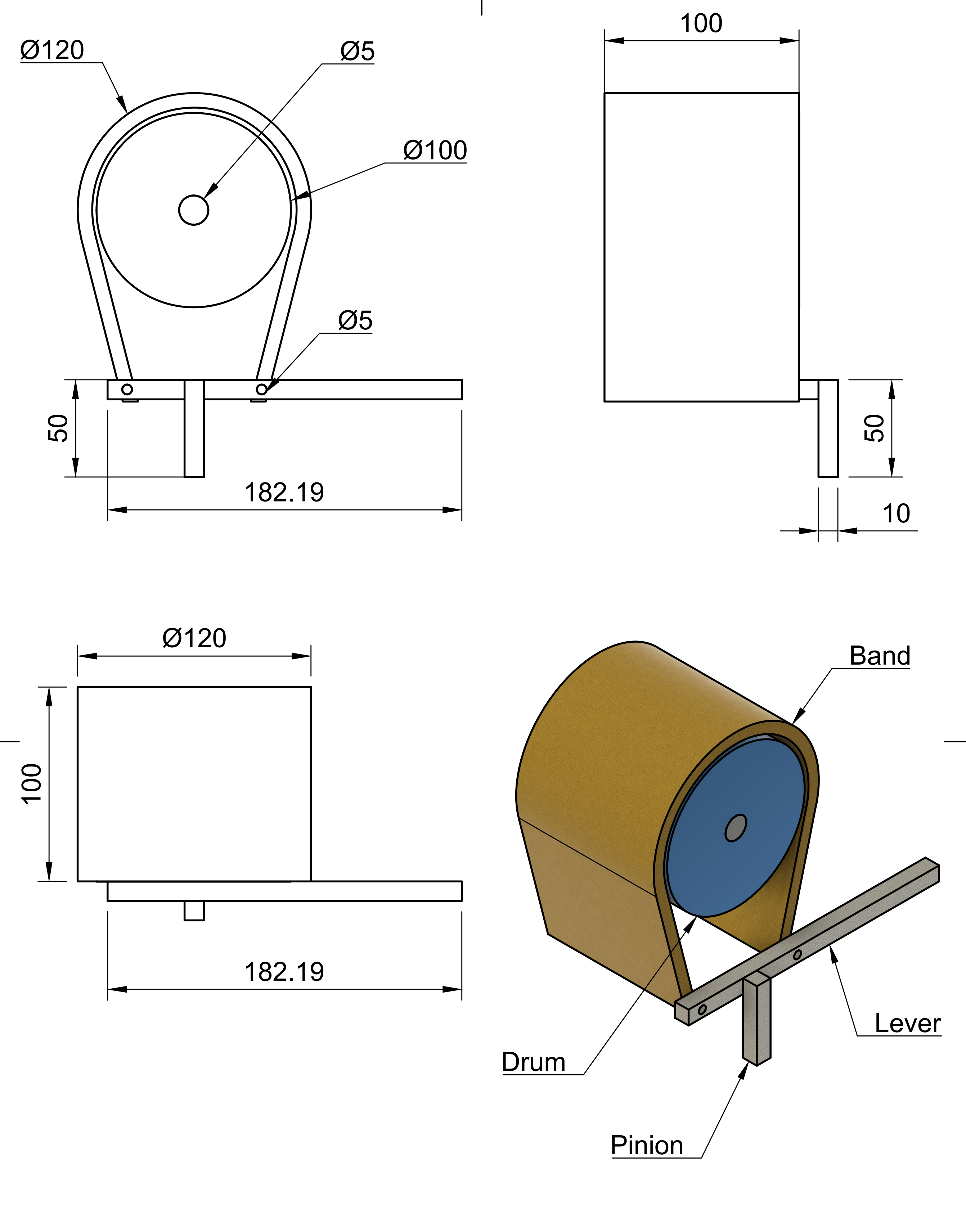
$$\frac{T_1}{T_2} = e^{\mu.\theta} \quad \text{or} \quad 2.3 \log\left(\frac{T_1}{T_2}\right) = \mu.\theta$$

and braking force on the drum = T1 - T2
∴ Braking torque on the drum, TB =(T1 - T2).r (.......Neglecting the thickness of the band)
= (T1- T2).re
(.......Considering the thickness of the band)

Now considering the equilibrium of the lever OBC. It may be noted that when the drum rotates in the clockwise direction, the end of the band attached to the fulcrum O will be slack with tension T2 and end of the band attached to B will be tight with tension T1. On the other hand, when the drum rotates in the anticlockwise direction, the tensions in the band will reverse, i.e. the end of the band attached to the fulcrum O will be tight with tension T1 and the end of the band attached to B will be slack with tension T2. Now taking moments about the fulcrum O, we have

$$P.l = T_1.b \quad \text{...(for clockwise rotation of the drum)}$$

$$P.l = T_2.b \quad \text{...(for anticlockwise rotation of the drum)}$$



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