

**Q-3 a) The coefficient of friction between a certain brass block and a large revolving turntable is  $\mu = 0.23$ . How far from the axis of rotation can the block be placed before it slides off the turntable if it is rotating at  $33(1/3)$  rev/min?**

The limiting frictional force is given by  $\mu mg$  and this is providing the centripetal force

The angular velocity is  $100/3$  rev/min =  $\frac{100 * 2\pi}{3 * 60} = 3.490$  rad/s

Thus the centripetal force is given by

$$F = m\omega^2 r = \mu mg$$

Gives  $r = \frac{\mu g}{\omega^2} = \frac{0.23 * 9.8}{[3.490]^2} = 0.185m$

**b) A certain car has a minimum turning radius of 8.2 m. If the coefficient of static friction between the tires and road is  $\mu = 0.23$ , what is the maximum speed the car can have without skidding on an unbanked road if the steering wheel is turned fully to the right?**

The limiting frictional force is  $\mu mg$  and hence again in the same way we can write

$$F = mv^2/r = \mu mg$$

Gives  $V^2 = \mu gr = 0.23 * 9.8 * 8.2 = 18.4828$

Hence  $v = 4.299$  m/s

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