# NCERT Analog Assignment

EE23BTECH11007 - Aneesh Kadiyala*

TABLE 0
PARAMETERS

| Parameter | Value | Description |
|---|---|---|
| $v$ | | Speed |
| $R$ | | Radius of circular track |
| $M$ | | Mass of bob |
| $g$ | | Acceleration due to gravity |
| $g_e$ | $\sqrt{g^2+a^2}$ | Effective gravitational acceleration |

**Question 11.14.17:** A simple pendulum of length $l$ and having a bob of mass $M$ is suspended in a car. The car is moving in a circular track of radius $R$ with a uniform speed $v$. If the pendulum makes small oscillations in a radial direction about its equilibrium position, what will be its time period?
**Solution:**

$$a_{centripetal} = \frac{v^2}{R} \tag{1}$$

$$F_{centrifugal} = \frac{Mv^2}{R} \tag{2}$$

$$\implies a_{centrifugal} = \frac{v^2}{R} \tag{3}$$

Time period of a simple pendulum $T$ is given by:

$$T = 2\pi\sqrt{\frac{l}{g_e}} \tag{4}$$

$$= 2\pi\sqrt{\frac{l}{\sqrt{g^2+a_{centrifugal}^2}}} \tag{5}$$

$$= 2\pi\sqrt{\frac{lR}{\sqrt{g^2R^2+v^4}}} \tag{6}$$

Therefore, the time period of the pendulum is $2\pi\sqrt{\frac{lR}{\sqrt{g^2R^2+v^4}}}$ seconds.