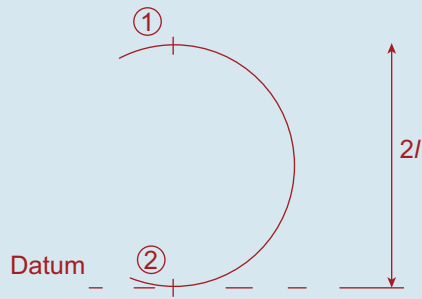


Q. 6.



$$\text{P.E.} = mgh$$

$$\text{K.E.} = \frac{1}{2}mv^2$$

(i) **Energy**

$$\begin{aligned} \text{P.E.}_{\textcircled{2}} + \text{K.E.}_{\textcircled{2}} &= \text{P.E.}_{\textcircled{1}} + \text{K.E.}_{\textcircled{1}} \\ \Rightarrow \frac{1}{2}mv^2_{\textcircled{2}} &= 2mgl + \frac{1}{2}mv^2_{\textcircled{1}} \\ \Rightarrow v^2_{\textcircled{2}} - v^2_{\textcircled{1}} &= 4gl \dots \textcircled{1} \end{aligned}$$

(ii) **Forces**

At $\textcircled{2}$ **NZL: $\Sigma F = ma$**
 $\uparrow T_2 - mg = \frac{mv^2_{\textcircled{2}}}{l} \dots \textcircled{2}$

At $\textcircled{1}$ $\downarrow T_1 + mg = \frac{mv^2_{\textcircled{1}}}{l} \dots \textcircled{3}$
 $\textcircled{2} - \textcircled{3} : T_2 - T_1 - 2mg = \frac{m}{l}[v^2_{\textcircled{2}} - v^2_{\textcircled{1}}]$

From Eqn $\textcircled{1}$: $T_2 - T_1 - 2mg = \frac{m}{l}[4gl]$
 $\Rightarrow T_2 = T_1 + 6mg$ **QED**