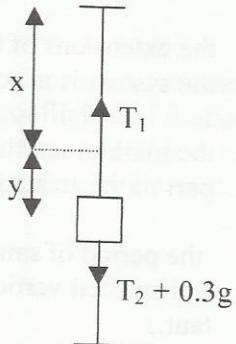


2000

6(b) cont.

A horizontal spring with stiffness $k = 0.3 \text{ N/mm}$ is attached to a vertical wall at its left end and to a mass $m = 1 \text{ kg}$ at its right end. A vertical displacement y is measured downwards from the equilibrium position. At time $t = 0$, the mass is at a displacement $y_1 = 10 \text{ mm}$ below the equilibrium position and has a velocity $v_1 = 0$. The displacement y is given by the equation



$$\begin{aligned}\text{(iii)} \quad \text{Force in dirn. y inc.} &= T_2 + 0.3g - T_1 \\&= k(x_2 - y) + 0.3g - k(x_1 + y) \\&= k(x_2 - x_1) + 0.3g - 2ky \\&= k\left(\frac{-0.3g}{k}\right) + 0.3g - 2ky \\&= -2ky \\ \Rightarrow \quad \text{acceleration} &= \frac{-2k}{0.3}y\end{aligned}$$

$$\therefore \text{SHM about } y=0 \text{ with } \omega = \sqrt{\frac{2k}{0.3}}$$

$$T = \frac{2\pi}{\omega} = 2\pi\sqrt{\frac{0.3}{2k}} \text{ or } \pi\sqrt{\frac{0.6}{k}}$$

5

10