## Chapter 13 Exercise 13A

**Q. 1.** $F = k(l - l_0)$

where $l$ = current length

$l_0$ = original length

$k$ = spring constant

(i) $F = 10(6 - 5)$

$\Rightarrow F = 10$ N

(ii) $F = 10(10 - 5)$

$\Rightarrow F = 50$ N

(iii) $F = 10(5.2 - 5)$

$\Rightarrow F = 2$ N

**Q. 2.** $l_0 = 2, k = 9$

(i) $F = 9(3 - 2)$

$\Rightarrow F = 9$ N

(ii) $F = 9(5 - 2)$

$\Rightarrow F = 27$ N

(iii) $F = 9\left(\frac{10}{3} - 2\right)$

$\Rightarrow F = 12$ N

$kl = F + kl_0$

$\Rightarrow 9l = 54 + 9(2)$

$\Rightarrow l = 8$ m

**Q. 3.** (i)


$F_l = 2(10 - 1) = 18$ N

$F_r = 4(10 - 1) = 36$ N

$\therefore F = F_r - F_l = 36 - 18 = 18$ N

(ii)


$F_l = 2(x - 1) = 2x - 2$

$F_r = 4(20 - x - 1) = 76 - 4x$

$F_l = F_r$

$\Rightarrow 2x - 2 = 76 - 4x$

$\Rightarrow x = 13$ m

from left hand wall (LHW)

**Q. 4.** (i)


$F_l = 5(x - 1) = 5x - 5$

$F_r = 3(19 - x - 2) = 51 - 3x$

$F_l = F_r$

$\Rightarrow 5x - 5 = 51 - 3x$

$\Rightarrow x = 7$ m from LHW

(ii) $F_l = 5x - 5$

$F_r = 51 - 3x$

$F_r - F_l = 16$

$\Rightarrow (51 - 3x) - (5x - 5) = 16$

$\Rightarrow x = 5$ m from LHW

**Q. 5.** (i)


$F_l = 7(x - 2) = 7x - 14$

$F_r = 3(35 - x - 3) = 96 - 3x$

$F_l = F_r$

$\Rightarrow 7x - 14 = 96 - 3x$

$\Rightarrow x = 11$ m from LHW

(ii) $F_l = 7x - 14, \quad F_r = 96 - 3x$

If the force is 40 N to the right, then

$F_r - F_l = 40$

$\Rightarrow (96 - 3x) - (7x - 14) = 40$

$\Rightarrow 110 - 10x = 40$

$\Rightarrow x = 7$

$\Rightarrow 7$ metres from LHW

If the force is 40 N to the left, then

$F_l - F_r = 40$

$\Rightarrow (7x - 14) - (96 - 3x) = 40$

$\Rightarrow 10x - 110 = 40$

$\Rightarrow x = 15$ m from LHW

**Q. 6.** $F = k(l - l_0)$

$= 50(2 - 1)$

$= 50$ N

This is the centripetal force and must equal $m\omega^2 r$

$\therefore m\omega^2 r = 50$

$\Rightarrow 1(\omega)^2(2) = 50$

$\Rightarrow \omega = 5$ rad/s