DPP – 01

SOLUTION

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1. $F = 3m_1$ .....(i)

$F = m_2$ .....(ii)

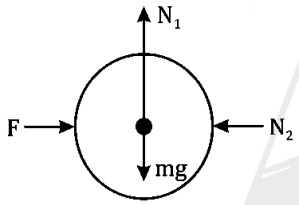
$\frac{m_1}{m_2} = \frac{1}{3} \Rightarrow m_2 = 3m_1$

$\Rightarrow F = (m_1 + m_2)a$

$3m_1 = (m_1 + 3m_1)a$

$a = \frac{3}{4}m_1 s^2$

2.



3. $F = 4Ma$

$a = \frac{F}{4M}$

$F - T_1 = M \times \frac{F}{4M} = \frac{F}{4}$

$T_1 = \frac{3F}{4}$

$T_1 - T_2 = M \times \frac{F}{4m} = \frac{F}{4}$

$T_2 = \frac{3F}{4} - \frac{F}{4} = \frac{F}{2}$

$T_3 = M \times \frac{F}{4M} = \frac{F}{4}$

$T_1 = \frac{3F}{4}, T_2 = \frac{F}{2}, T_3 = \frac{F}{4}$

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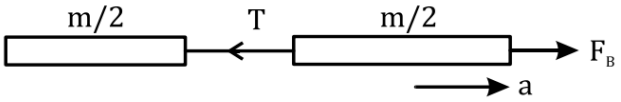
4. $F_{net} = ma$

$$F_B - F_A = ma$$

$$a = \frac{F_B - F_A}{m}$$

5.

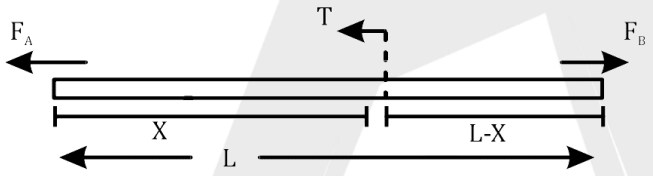


$$F_B - T = \frac{m}{2}\left(\frac{F_B - F_A}{m}\right)$$

$$F_B - \frac{F_B - F_A}{2} = T$$

$$T = \frac{F_B + F_A}{2}$$

6.



$$F_B - T_x = \frac{m}{L}(L - x) \cdot \left(\frac{F_B - F_A}{m}\right)$$

$$F_B - T_x = \left(1 - \frac{x}{L}\right)(F_B - F_A)$$

$$T_x = F_B - \left(F_B - \frac{F_B x}{L} - F_A + \frac{F_A x}{L}\right)$$

$$T_x = F_A + \frac{x}{L}(F_B - F_A)$$

$$T_x = \left(\frac{F_B - F_A}{L}\right)x + F_A$$

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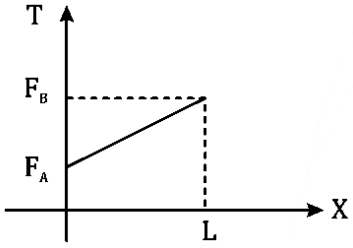
7.



$$T_x = \left(\frac{F_B - F_A}{L}\right)x + F_A$$

$$x = 0\ T_x = F_A$$

8. (C, D)

9. $F = F_0\left[1 - \left(\frac{t-T}{T}\right)^2\right]$

$$a = \frac{F_0}{m}\left[1 - \left(\frac{t-T}{T}\right)^2\right]$$

$$\frac{dv}{dt} = \frac{F_0}{m}\left[1 - \left(\frac{t-T}{T}\right)^2\right]$$

$$\int_0^v dv = \int_0^{2T} \frac{F_0}{m}\left[1 - \left(\frac{t-T}{T}\right)^2\right]$$

$$= \frac{F_0}{m}\left[t - \frac{1}{T^2}\frac{(t-T)^3}{3}\right]_0^{2T}$$

$$= \frac{F_0}{m}\left[(2T - 0) - \frac{1}{3T^2}\{(2T-T)^3 - (0-T)^3\}\right]$$

$$= \frac{F_0}{m}\left[2T - \frac{1}{3T^2}[T^3 + T^3)\right]$$

$$= \frac{F_0}{m}\left(2T - \frac{2T^3}{3T^2}\right) = \frac{F_0}{m}\left(2T - \frac{2T}{3}\right)$$

$$= \frac{F_0}{m}\left(\frac{4T}{3}\right) = \frac{4F_0T}{3}$$