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DPP 03

SOLUTION

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1. since the block and the balances are in equilibrium and considering that balances are massless.

$\therefore K_1 = 10Kg$

$k_1 = k_2 = 10\ kg$

$\therefore\ k_1 + k_2 = 20\ kg$

2. In spring balance pseudo force will act on object, i.e. increased weight will be shown In case of physical balance, pseudo force will act both side it means it will cancel to each other so real weight will be shown.

3. Case I

B is in static equilibrium

$T^1 = 2mg$ _____(1)

A is released

$T^1 - mg = ma$ _____(2)

from (1) and (2) $a = g$

Case II → As A is in static equilibrium

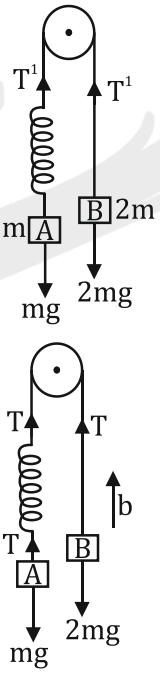
$\therefore T = mg$ _____(3)

B is released

$2mg - T = 2mb$ _____(4)

from (2) and (4) $\Rightarrow b = g/2$

$\because \frac{a}{b} = 2$



4. If T_1, T_2, T_3 are the tensions in the strings in the three cases, we have

$T_1 = \frac{2\,m_1\,m_2\,g}{m_1+m_2} = \frac{2\times2\times2\,g}{(2+2)} = 2\,g$

$T_2 = \frac{2\times3\times2\,g}{(3+2)} = 2.4\,g$

$T_3 = \frac{2\times1\times2\,g}{(1+2)} = 1.33\,g$

$T_3 = \frac{2\times1\times2\,g}{(1+2)} = 1.33\,g$

As $x \propto T$ and $T_2 > T_1 > T_3$

$\therefore x_2 > x_1 > x_3$.

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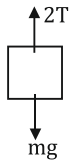
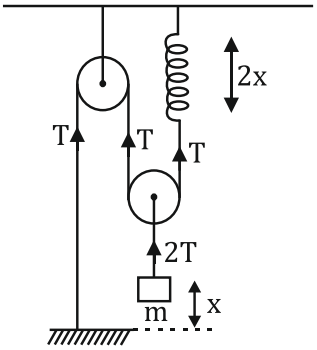
5. $F_s = k(2x)$

→ spring force

$T = F_s = 2kx$

FBD

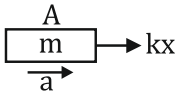




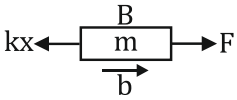
$2T = ma \Rightarrow 2(2kx) = ma$

$a = \frac{4kx}{m}$

6.



$kx = ma$ ____(1)

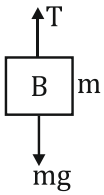


$F - kx = mb$ _____(2)

(2) – (1) $F - 2kx = m(b - a)$

$b - a = \frac{F-2Kx}{m}$

7. FBD of mass m



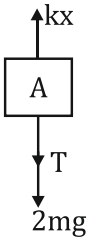
$T = mg$ ____(1)

FBD of mass 2m

$Kx = T + 2mg$

$\because T = mg.$

$Kx = 3mg$ _____(2)



After string cut

$a_A = \frac{3mg-2mg}{2m}$

$a_A = g/2$

mass m will be falling under gravity so

$a_B = g$

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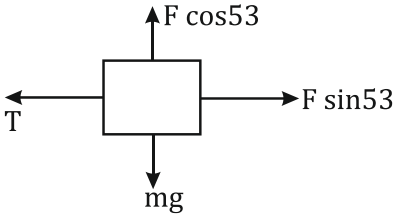
8. FBD of Block



$F\cos 53 = mg \Rightarrow F = \frac{5}{3}mg$

when spring is cut $T = 0$

$F \sin 53^\circ = ma$

$a = \frac{F}{m} \cdot \frac{4}{5} = \frac{5}{3}mg \times \frac{4}{5m}$

$a = \frac{4g}{3}$

9. ∵ At t=0, it will be free fall condition.