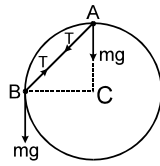
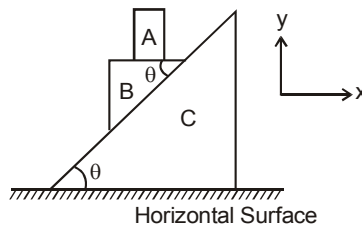


4. Objects A and B each of mass m are connected by light inextensible cord. They are constrained to move on a frictionless ring in a vertical plane as shown in figure. The objects are released from rest at the positions shown. The tension in the cord just after release will be



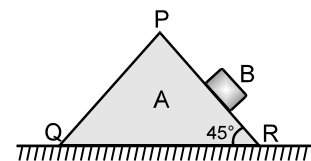
- (A) $mg\sqrt{2}$ (B) $\frac{mg}{\sqrt{2}}$ (C) $\frac{mg}{2}$ (D) $\frac{mg}{4}$

5. In the figure shown all the surface are smooth. All the blocks A, B and C are movable X-axis is horizontal and y-axis vertical as shown. Just after the system is released from the position as shown.



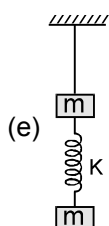
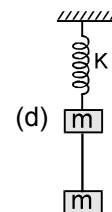
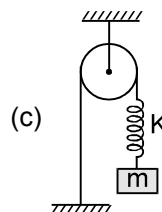
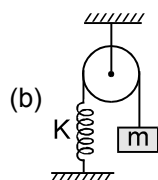
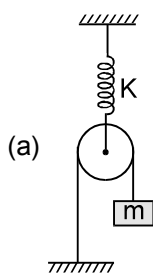
- (A) Acceleration of 'A' relative to ground is in negative y-direction
 (B) Acceleration of 'A' relative to B is in positive x-direction
 (C) The horizontal acceleration of 'B' relative to ground is in negative x-direction.
 (D) The acceleration of 'B' relative to ground directed along the inclined surface of 'C' is greater than $g \sin \theta$.

6. A block B of mass 0.6 kg slides down the smooth face PR of a wedge A of mass 1.7 kg which can move freely on a smooth horizontal surface. The inclination of the face PR to the horizontal is 45° . Then :



- (A) the acceleration of A is $3g/20$
 (B) the vertical component of the acceleration of B is $23g/40$
 (C) the horizontal component of the acceleration of B is $17g/40$
 (D) none of these

7. Find the tension in the string and the extension in the spring at equilibrium. Where pulley, strings and springs are ideal.



Answers Key

DPP NO. - 28

1. (C) 2. (A) 3. (B) 4. (B)

5. (A)(B)(C)(D) 6. (A)(B)(C)

7. (a) $T = mg$, $x = \frac{2mg}{K}$;

(b) $T_1 = mg$, $T_2 = 2mg$, $x = \frac{mg}{K}$;

(c) $T_1 = mg$, $T_2 = 2mg$, $x = \frac{mg}{K}$;

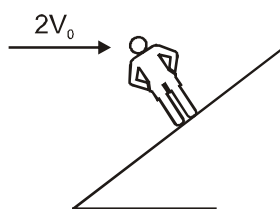
(d) $T = mg$, $x = \frac{2mg}{K}$; (e) $T = 2mg$, $x = \frac{mg}{K}$

Hint & Solutions

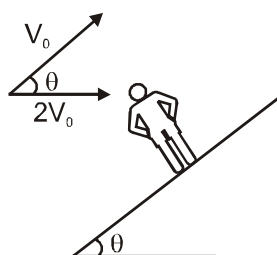
DPP NO. - 28

1. If component of velocity normal to incline are equal, time of flight is same. Also if horizontal components are equal, range on inclined plane will be equal for both.

2. Velocity of rain with respect to man initially as shown



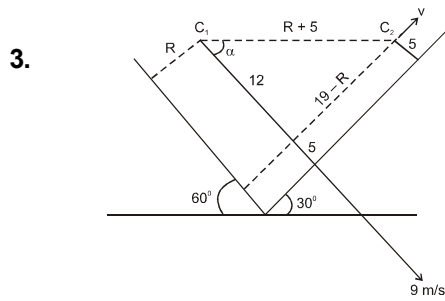
Velocity relative to man when it increase its speed to $2V_0$



So resultant velocity of rain with respect to man

$$= \sqrt{(2V_0)^2 + (V_0)^2 + 4V_0^2 \cos 37^\circ} = \sqrt{\frac{41}{5}} V_0$$





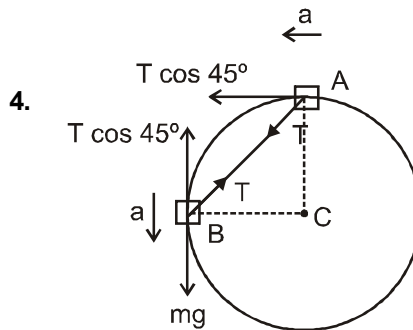
$$9 \cos \alpha = v \sin \alpha \quad \rightarrow \quad (i)$$

$$\frac{19 - R}{12} = \tan \alpha \quad \rightarrow \quad (ii)$$

$$(R + 5)^2 = (12)^2 + (19 - R)^2 \quad [\text{Pythagorean}]$$

$$\Rightarrow R = 10$$

Hence from (i) and (ii) $v = 12 \text{ m/s}$



On block B :

$$mg - T \cos 45^\circ = ma \quad \dots(i)$$

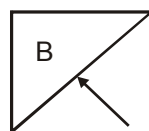
on block A :

$$T \cos 45^\circ = ma \quad \dots(ii)$$

by equation (i) and (ii)

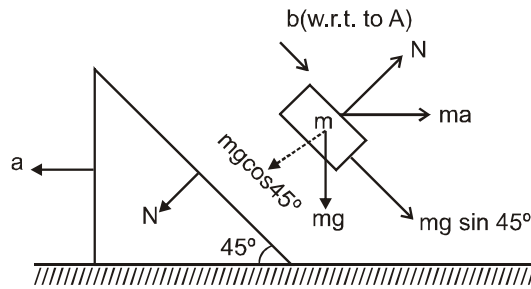
$$T = \frac{mg}{\sqrt{2}}$$

5. There is no horizontal force on block A, therefore it does not move in x-direction, whereas there is net downward force ($mg - N$) is acting on it, making its acceleration along negative y-direction. Block B moves downward as well as in negative x-direction. Downward acceleration of A and B will be equal due to constrain, thus w.r.t. B, A moves in positive x-direction.



Due to the component of normal exerted by C on B,
it moves in positive x-direction

6. F.B.D. of block B w.r.t. wedge



for block A

$$N \cos 45^\circ = 1.7 a \quad \dots(i)$$

for block B

$$0.6g \sin 45^\circ + 0.6a \cos 45^\circ = 0.6b \quad \dots(ii)$$

$$N + 0.6 a \cos 45^\circ = 0.6 g \cos 45^\circ \quad \dots(iii)$$

by solving (i), (ii) & (iii)

$$a = \frac{3g}{20} \text{ and } b = \frac{23g}{20\sqrt{2}}$$

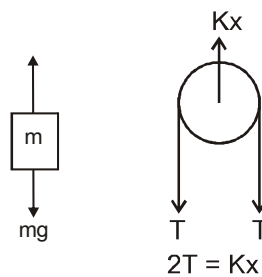
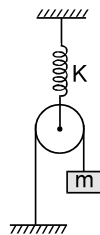
Now vertical component of acceleration of

$$B = b \cos 45^\circ = \frac{23g}{40}$$

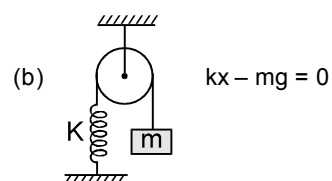
and horizontal component of acceleration of

$$B = b \sin 45^\circ - a = \frac{17g}{40}$$

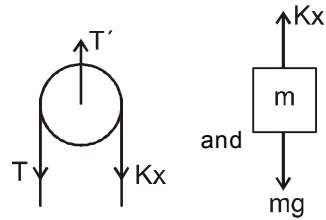
7. (a) F.B.D. of m FBD



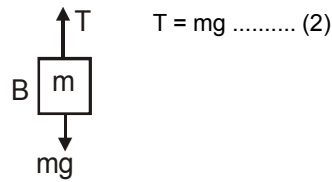
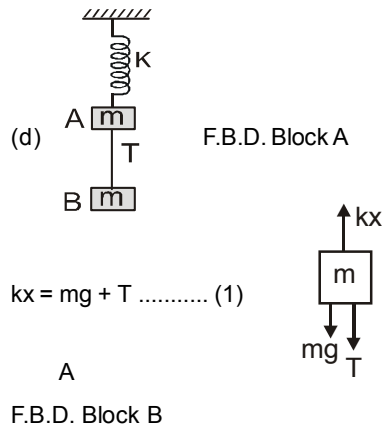
$$\frac{kx}{2} = mg \quad x = \frac{2mg}{k} \quad T = mg$$



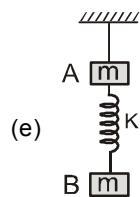
F.B.D. of pulley



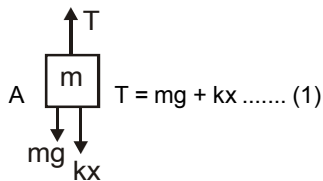
$$x = \frac{mg}{k} \quad T = mg$$



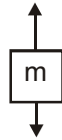
$$\therefore kx = 2mg \quad x = \frac{2mg}{k}$$



F.B.D. of Upper Block A



F.B.D. of Lower Block (B)



$$kx = mg \dots (2) \therefore x = \frac{mg}{k}$$

$$\text{By (1) \& (2) } T = 2mg$$