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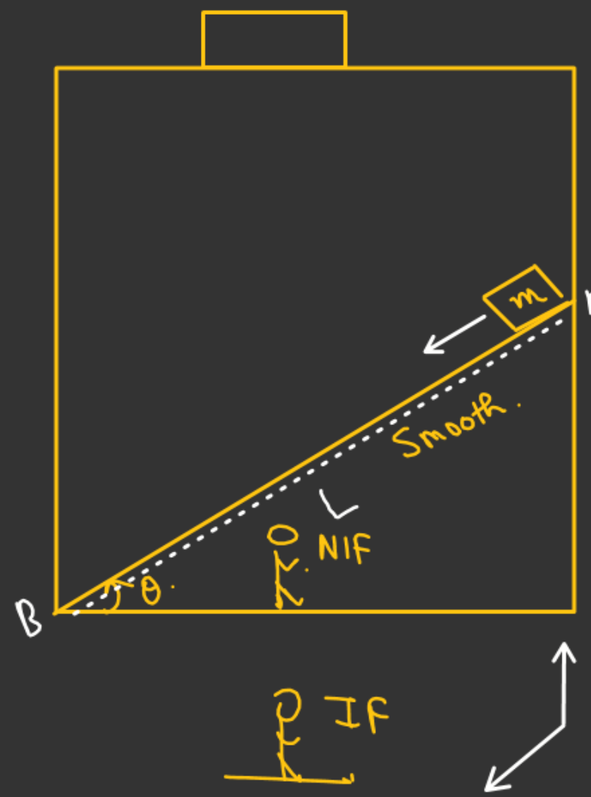
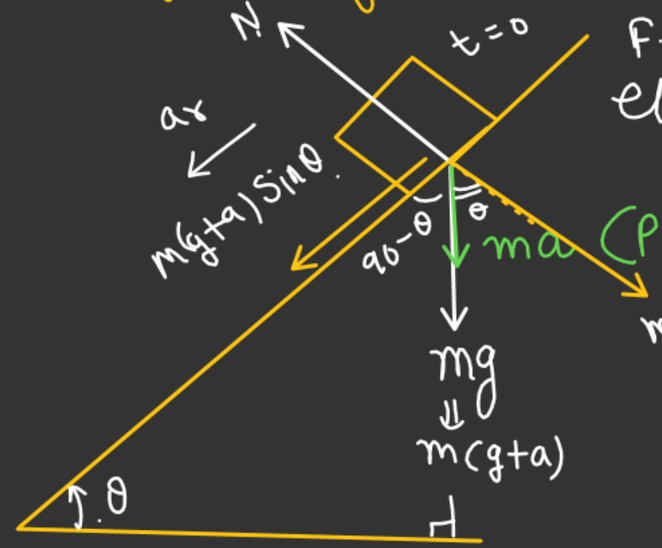
Questions based on pseudo :→

Block is released when elivator starts accleating upward. Find the time taken by block to reach at the floor of the elivator.





F.B.D w.r.t elevator $a_r = \frac{M(g+a)\sin\theta}{M}$

(Relative accle.)

$a_r = (g+a)\sin\theta$

$N = m(g+a)\cos\theta$

$L = \frac{1}{2} a_r \cdot t^2$

$t = \sqrt{\frac{2L}{a_r}}$

$t = \sqrt{\frac{2L}{(g+a)\sin\theta}}$ ✓

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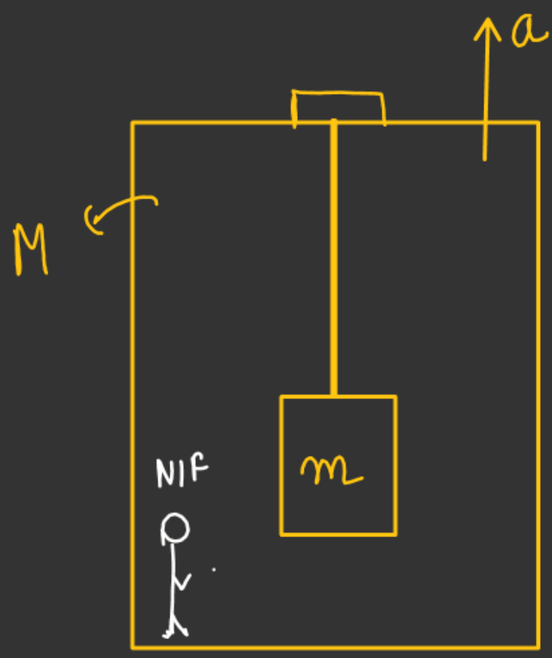
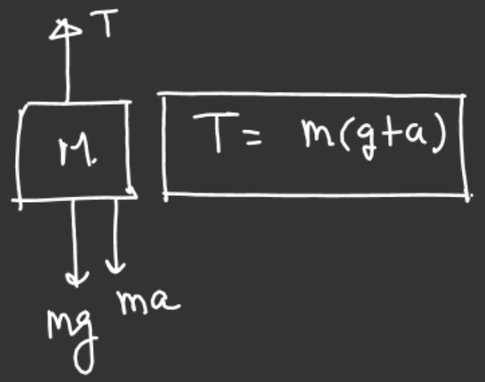
#. Tension in the String.

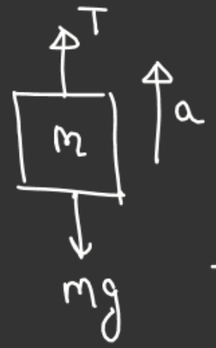


W.r.t NIF (Block at Rest)



$T = m(g+a)$

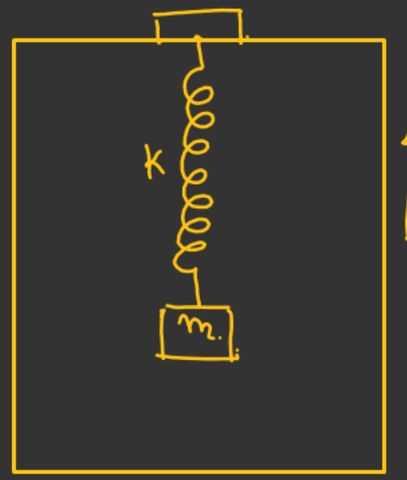
W.r.t earth ⇒ Accelerated Motion.



$T - mg = ma$

$T = m(g+a)$

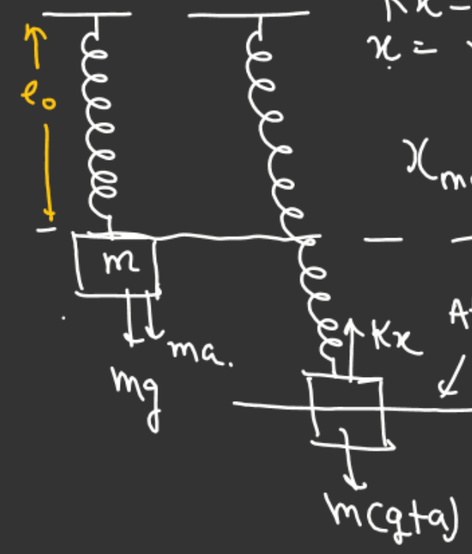
#



At the moment when elevator starts accelerating upward Spring at its natural length.

Find maximum elongation in the Spring.

F.B.D w.r.t elivator



$Kx = m(g+a)$

$x = \frac{m(g+a)}{K}$

$x_{max} = 2x = \frac{2m(g+a)}{K}$

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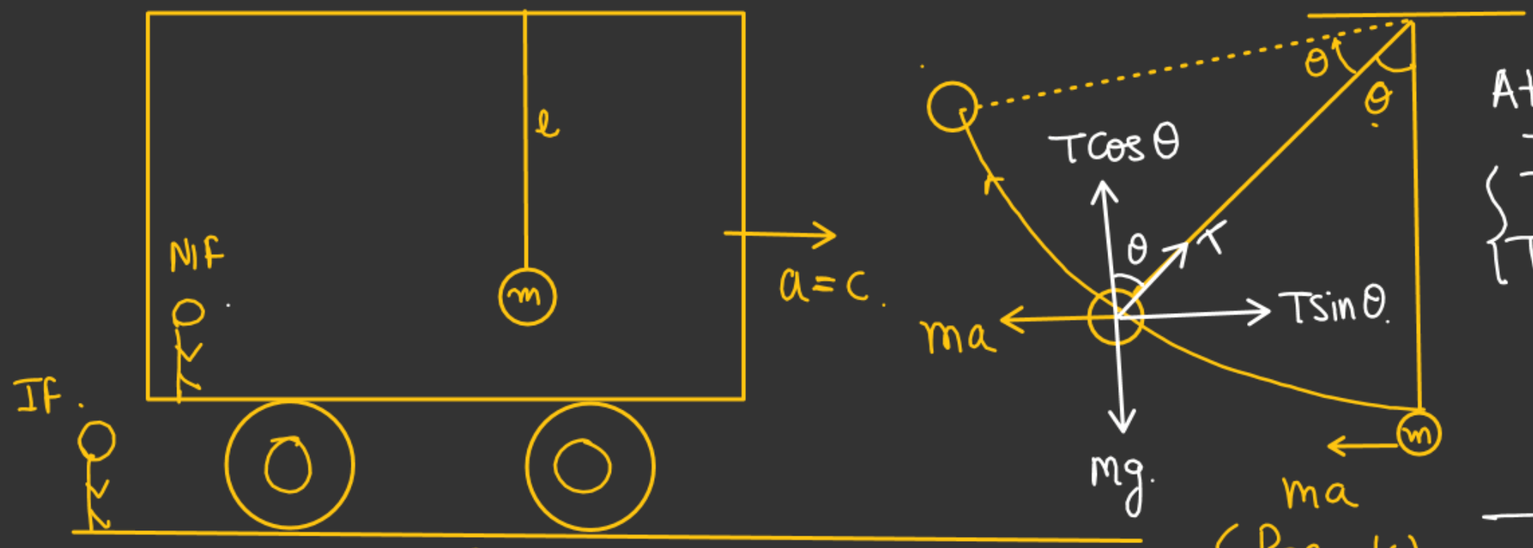
Trolley starts accelerating with acceleration a m/s². Find equilibrium angle made by string – bob system from vertical.

F.B.D w.r.t trolley.



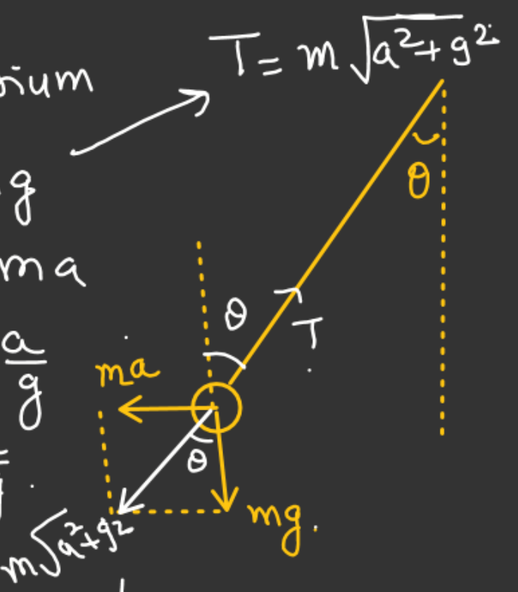
At Equilibrium

$T\cos\theta = mg$

$T\sin\theta = ma$

$\tan\theta = \frac{a}{g}$

$\theta = \tan^{-1}\frac{a}{g}$



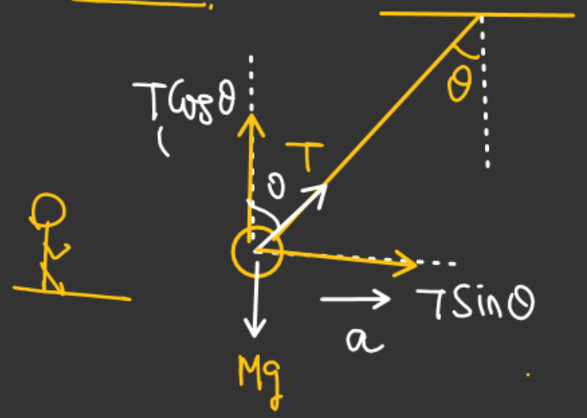
$\tan\theta = \frac{ma}{mg}$

$\tan\theta = \frac{a}{g}$

$\left(\theta = \tan^{-1}\frac{a}{g}\right)$

Another Method (M-2)

W.r.t earth



For vertical direction

$T\cos\theta = mg$ (Newton's 1st law) — (1)

In horizontal direction

$T\sin\theta = ma$ — (2)

$\tan\theta = \left(\frac{a}{g}\right)$

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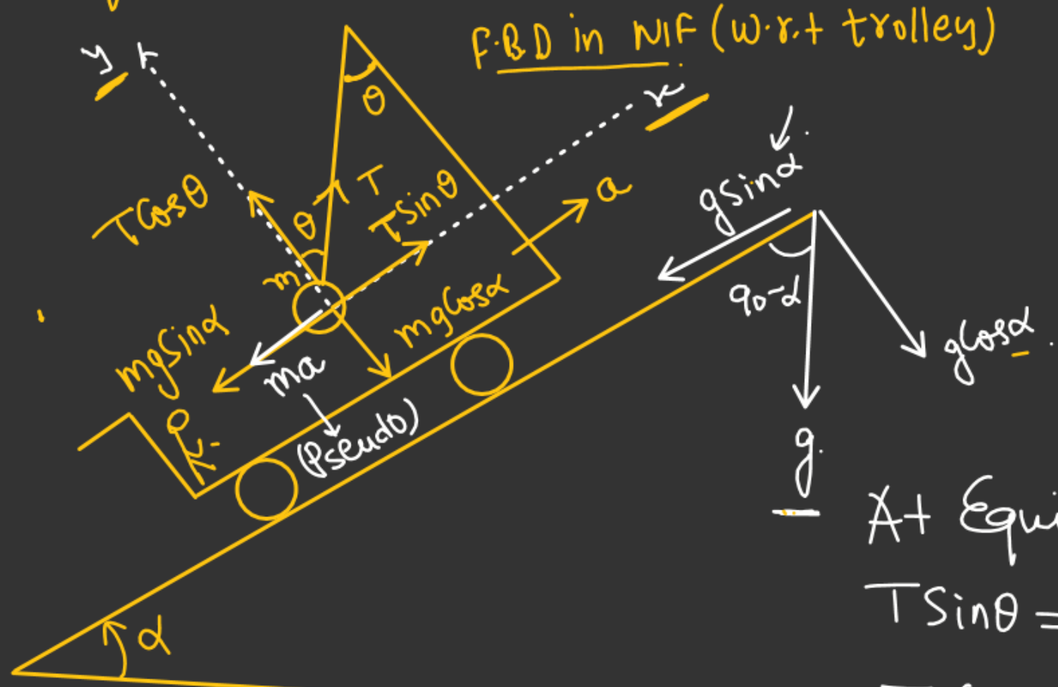
Find Equilibrium angle $\theta = ??$



At Equilibrium

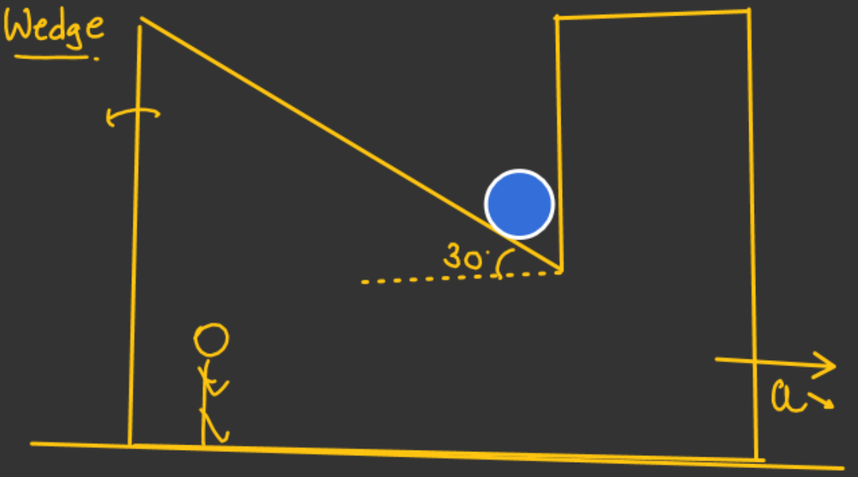
$$T\sin\theta = mg\sin\alpha + ma$$

$$T\cos\theta = mg\cos\alpha$$

$$\tan\theta = \left(\frac{a + g\sin\alpha}{g\cos\alpha}\right)$$

$$\theta = \tan^{-1}\left(\frac{a + g\sin\alpha}{g\cos\alpha}\right)$$

Find a so that ball doesn't move w.r.t wedge.



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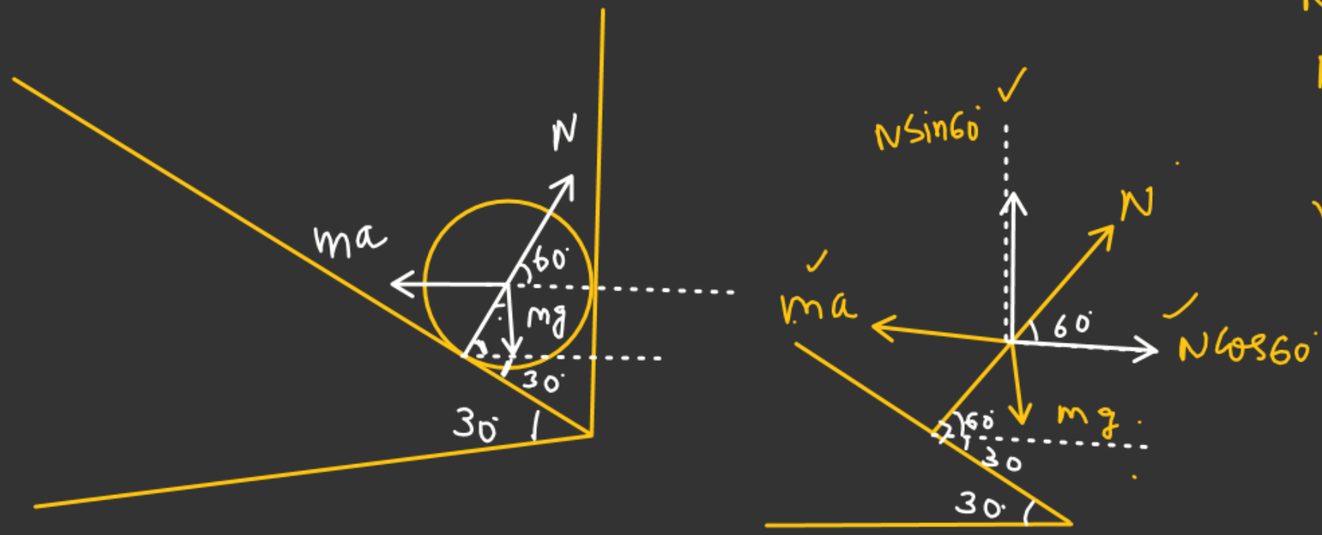

$N \sin 60° = mg$

$N = \frac{mg}{\sin 60°} = \frac{2mg}{\sqrt{3}}$

$ma = N \cos 60°$

$ma = \frac{N}{2}$

$ma = \frac{2mg}{\sqrt{3}} \times \frac{1}{2}$

$ma = \frac{mg}{\sqrt{3}}$

$a = g/\sqrt{3}$

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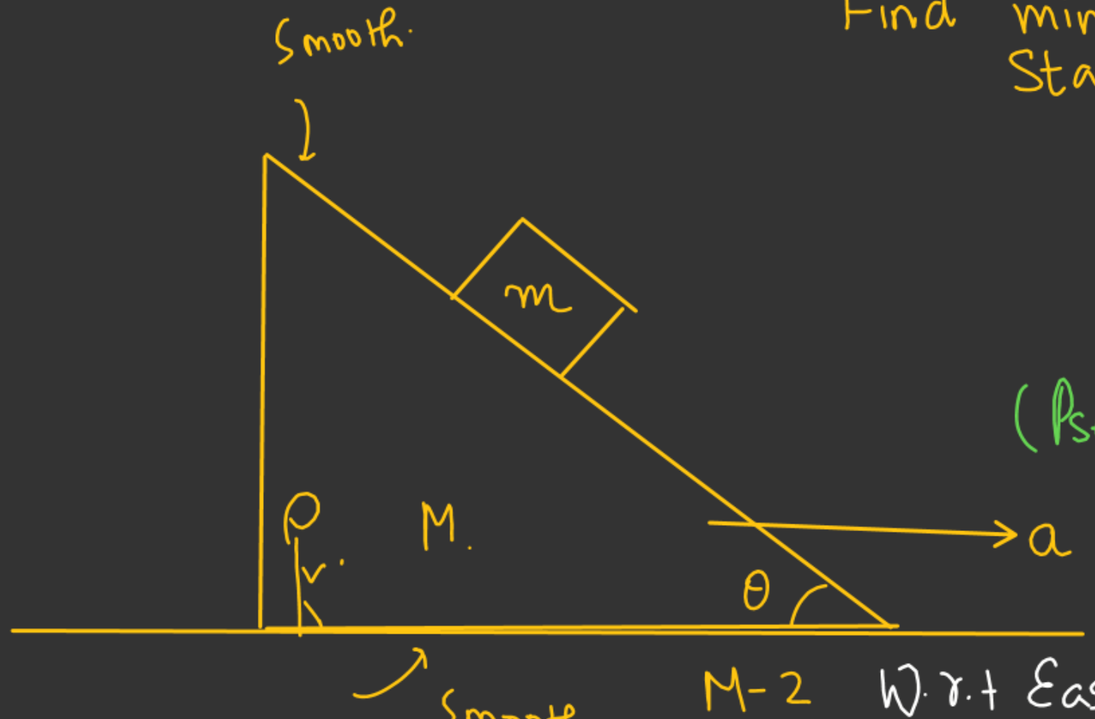
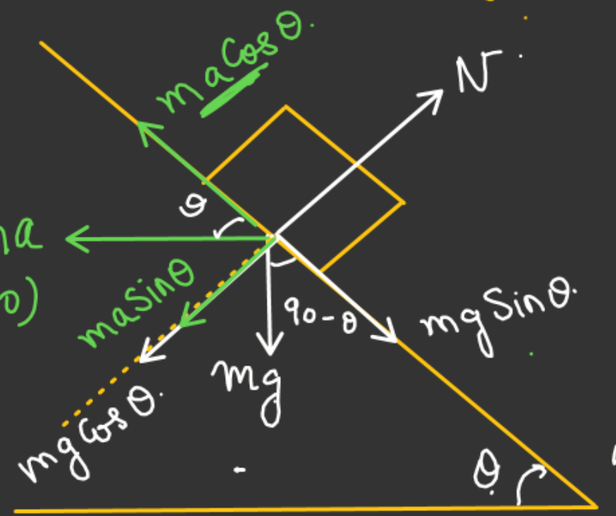
Find min a so that block remain Stationary w.r.t Wedge.



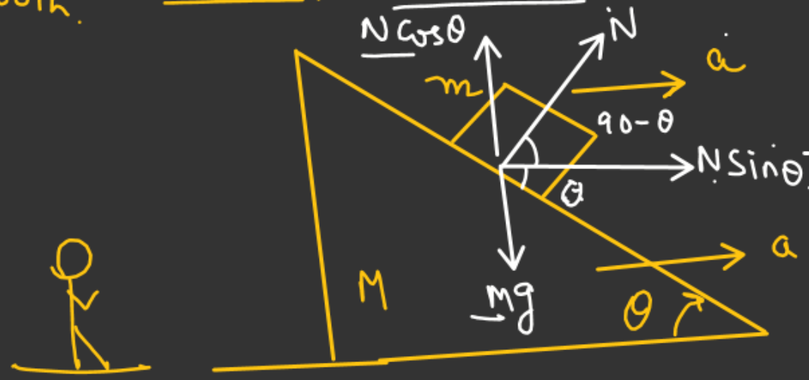


$ma\cos\theta = mg\sin\theta$

$\alpha\alpha$

$a = g\tan\theta$

M-2 W.r.t Earth



$N\sin\theta = ma$ (2nd Law)

$N\cos\theta = mg$ (1st Law)

$\tan\theta = \frac{a}{g}$

$a = g\tan\theta$

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H.W. Sheet/Module.

H.C. Verma ⇒ (Except pully questions)

Ex:-1 ✓

2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 14, 20, 22, 23, 24, 26

27,

Ex:- 2 ✓

1, 8, 10.

Ex-3 :- 5, 8, 9, 10, 11, 12, 13.

Ex-4 :- 18.

P.T-1

1, 3, 5, 7, 13,

P.T-2

4, 7

P.T-3

1, 8, 9, 10.