

HW

1) A 5kg body collides with a 20kg body & exerts 20N force on it. So force exerted by 20kg body on 5kg body is  
[ 20N

2) A man of mass 50kg is pulling (being suspended) a light rope suspended from a roof. What force the rope pulling the roof?

$m = 50\text{kg}$ ,  $a = g = 10\text{m/s}^2$  Force rope pulling roof is

$$F = ma \rightarrow mg$$

$$F = 50 \times 10 = 500\text{N}$$

3) A man of mass 50kg is pulling (being suspended from it) a rope of mass 5kg suspended from a roof. By what force the rope is pulling roof?

Total mass =  $50 + 5 = 55\text{kg}$

$$a = g = 10\text{m/s}^2$$

$$F = ma = mg$$

$$F = 55 \times 10 = 550\text{N}$$

Q. (6) A pendulum bob of mass 50g is suspended from the ceiling of an elevator. Find tension in string

if elevator

- (a) goes up with  $a = 1.2 \text{ m/s}^2$   
 (b) goes down with  $a = 1.2 \text{ m/s}^2$   
 (c) goes up with uniform velocity  
 (d) goes down with  $a = 1.2 \text{ m/s}^2$   
 (e) goes down with  $a = 1.2 \text{ m/s}^2$   
 (f) goes down with uniform velocity.

Soln: (a)  ~~$N = mg + ma$~~   
 ~~$N = 50 \times 10 + 50 \times 1.2$~~

Soln: - ~~ayyyyyy~~

(a) let  $N = T$

$a = 1.2 \text{ m/s}^2$

$m = 50 \text{ g} = \frac{50}{1000} \text{ kg}$

$N - mg = ma$

~~$T = 50 \times 10$~~   $T = m(g + a)$

$T = \frac{50}{1000} (9.8 + 1.2) = 0.55 \text{ N}$

(b)  $a = -1.2 \text{ m/s}^2$  (upward)

$T = m(g + (-a))$

$T = \frac{50}{1000} (9.8 - 1.2) = 0.43 \text{ N}$

(c)  $a = 0$  as  $v = \text{constant}$   
 $T = \frac{50}{1000} \times 9.8 = 0.49 \text{ N}$

(d) acceleration is  $1.2 \text{ m/s}^2$  downward  $T = m(g - a)$   
 $T = \frac{50}{1000} (9.8 - 1.2) = 0.43 \text{ N}$

(e)  $a_{\text{net}}$  down ward =  $-1.2 \text{ m/s}^2$   
 $T = \frac{50}{1000} (9.8 - (-1.2)) = 0.55 \text{ N}$

(f)  $v = \text{constant}$ ,  $a = 0$   
 $T = \frac{50}{1000} \times 9.8 = 0.49 \text{ N}$

(6) mass of monkey = 40 kg

It can stand maximum tension of 600 N

$$T_{\max} = 600 \text{ N}$$

(a) climbs up with  $a = 4 \text{ m/s}^2$

$$T - mg = ma$$

$$T = m(g + a)$$

$$\rightarrow 40(10 + 4)$$

$$T = 640 \text{ N}$$

$$T_{\max} < T$$

$\therefore$  The rope will break

(b)  $a = 4 \text{ m/s}^2$  downward

$$mg - T = ma$$

$$T = m(g - a)$$

$$\rightarrow 40(10 - 4)$$

$$\rightarrow 240 \text{ N}$$

$$T_{\max} > T$$

$\therefore$  The rope will not break

(c) Climbs up with uniform speed = 5 m/s

$$\therefore a = 0$$

$$T - mg = ma$$

$$T - mg = 0$$

$$T = mg = 40 \times 10 = 400 \text{ N}$$

$T_{\max} > T$   $\therefore$  the rope will not break

d) When the monkey hangs freely ~~the rope will break~~

$$\therefore a = g = 10 \text{ m/s}^2$$

$$mg + T = mg$$

$$T = m(g - g) = 0$$

$$T_{\text{max}} > T$$

$\therefore$  The rope won't break.