HW
31/7/21

ODM CONNECT APP HOMEWORK

Q1. A 5 kg body collides with a 20 kg body and exerts 20 N force on it. So force exerted by 20 kg body on 5 kg body is

a) 80 N b) 5 N c) 20 N d) 10 N

Q2. A man of mass 50 kg is pulling (being suspended from it) a light rope suspended from a roof. By what force the rope is pulling the roof?

Ans ATQ,

weight = mg = 50 × 9.8 = 490 N

∴ By 490 N force, the rope is pulling the roof.

Q3. A man of mass 50 kg is pulling (being suspended from it) a rope of mass 5 kg suspended from a roof. By what force the rope is pulling the roof?

Ans Mass of man = 50 kg

Mass of rope = 5 kg

Total mass = 50 kg + 5 kg = 55 kg

So, weight = mg = 55 × 9.8 = 539 N

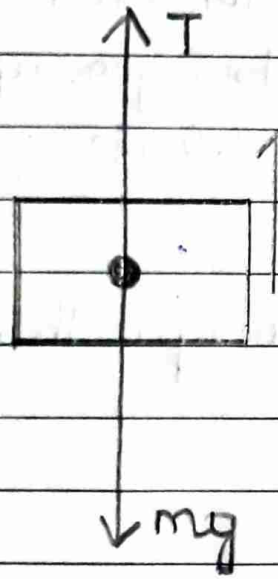
∴ By 539 N force, the rope is pulling the roof.

Q4. A pendulum bob of mass 50g is suspended from the ceiling of an elevator. Find the tension in the string if the elevator

Given:- m = 50g = 1/20 kg

a) goes up with acceleration 1.2 ms^{-2}.

Ans) Free Body Diagram incase of elevator goes up with acceleration:-



$T - mg = ma$

$\Rightarrow T = ma + mg$

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

$\Rightarrow T = \frac{1}{20}(1.2 + 9.8)$

$\Rightarrow T = \frac{11}{20} = 0.55N$

∴ 0.55N is the tension in the string when the elevator goes up with acceleration 1.2 m/s^2.

b) goes up with deceleration 1.2 ms^{-2}

Ans) $T - mg = -ma$

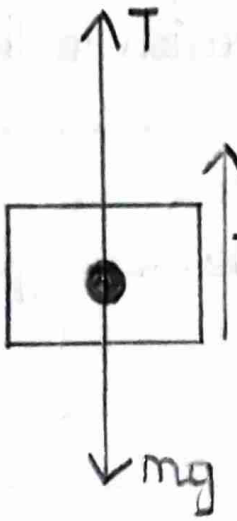
$\Rightarrow T = -ma + mg$

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

$\Rightarrow T = \frac{1}{20}(9.8 - 1.2)$

$\Rightarrow$ $T = \frac{8.6}{20} = 0.43N$

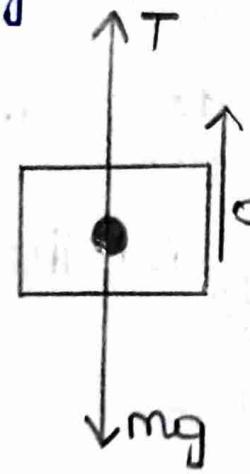
F.B.D in case of elevator when goes up with decelercation of $1.2\ m/s^2$:-



$\therefore$ 0.43 N is the tension in the string when the elevator goes up with decelercation of $1.2\ m/s^2$.

c) goes up with uniform velocity

Ans) F.B.D in case of elevator when goes up with uniform velocity :-

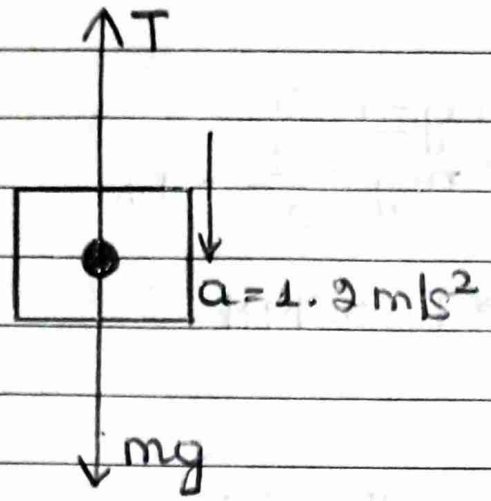


$T = mg = \frac{1}{20} \times 9.8 = 0.49N$

$\therefore$ 0.49 N is the tension in the string when the elevator goes up with uniform velocity.

d) goes down with acceleration $1.2\ ms^{-2}$

Ans) F.B.D incase of elevator when goes down with acceleration $1.2\ m/s^2$:-



$mg - T = ma$

$\Rightarrow T = mg - ma$

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

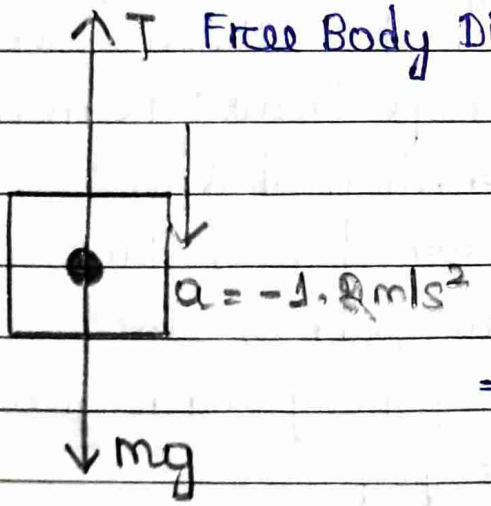
$\Rightarrow T = \frac{1}{10}(9.8 - 1.2)$

$\Rightarrow T = 0.42N$

$\therefore$ 0.42N is the tension in the string when the elevator goes down with acceleration $1.2\ m/s^2$

e) goes down with decleration $1.2\ ms^{-2}$

Ans) T Free Body Diagram:-



$mg - T = -ma$

$\Rightarrow mg + ma = T$

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

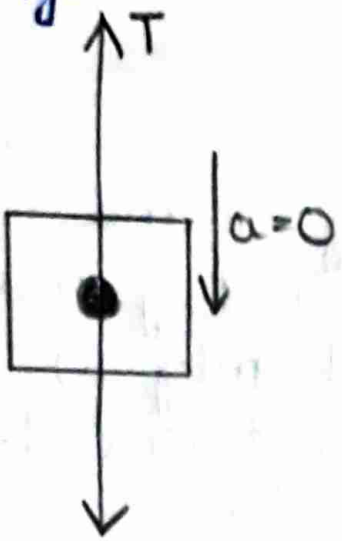
$\Rightarrow T = \frac{1}{10}(9.8 + 1.2)$

$\Rightarrow T = 0.55N$

$\therefore$ 0.55N is the tension in the string when the elevator goes down with decleration $1.2\ m/s^2$

f) goes down with uniform velocity

Ans) F.B.D. when the elevator goes down with uniform velocity:-



$mg - T = 0$

$\Rightarrow T = mg = \frac{1}{20} \times 9.8$

$\Rightarrow T = 0.49N$

$\therefore$ 0.49N is the tension in the string when the elevator goes down with uniform velocity.

Q5. A monkey of mass 40kg climbs on a rope which can stand a maximum tension of 600N. In which of the following cases will the rope break: the monkey

a) climbs up with an acceleration of $6 ms^{-2}$

b) climbs down with an acceleration of $4 ms^{-2}$

c) climbs up with a uniform speed of $5 ms^{-1}$

d) falls down the rope nearly freely under gravity [Ignore the mass of the rope]

Ans) (a) when the monkey climbs up with an acceleration a, then $T - mg = ma$ where T represents the tension in figure.

$\therefore T = mg + ma = m(g+a)$

or $T = 40kg(10+6)\,m/s^2 = 640N$

But the rope can withstand a maximum tension of 600N. So the rope will break.