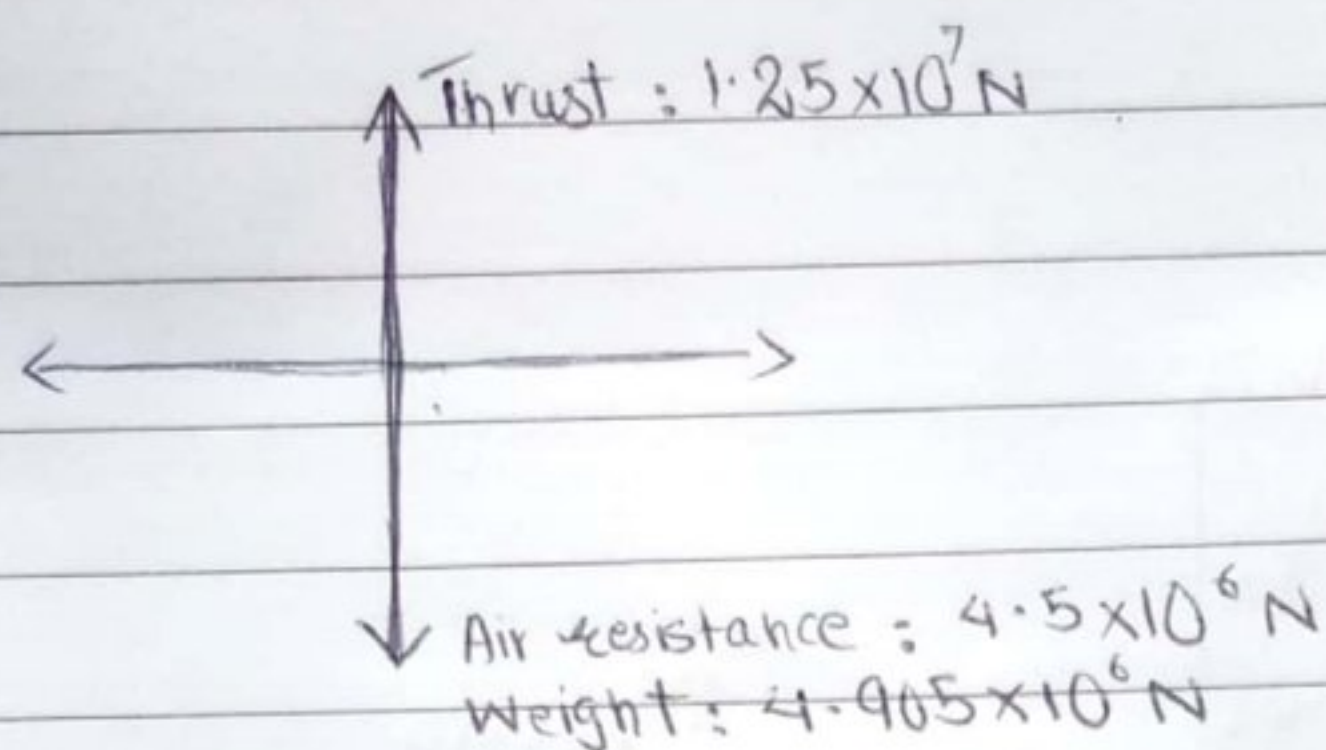


Score: 22/20
Excellent work

Ch-4

1-→ (a)



$$W = mg$$

$$W = 5 \times 10^5 \times 9.81 = 4.905 \times 10^6 \text{ N}$$

(b)

$$\text{Forward force} - \text{Backward force} = m \times a$$

$$(1.25 \times 10^7) - [(4.5 \times 10^6) + (4.905 \times 10^6)] = 5 \times 10^5 \times a$$

$$\text{rocket's acceleration} = a = 6.19 \text{ m/s}^2$$

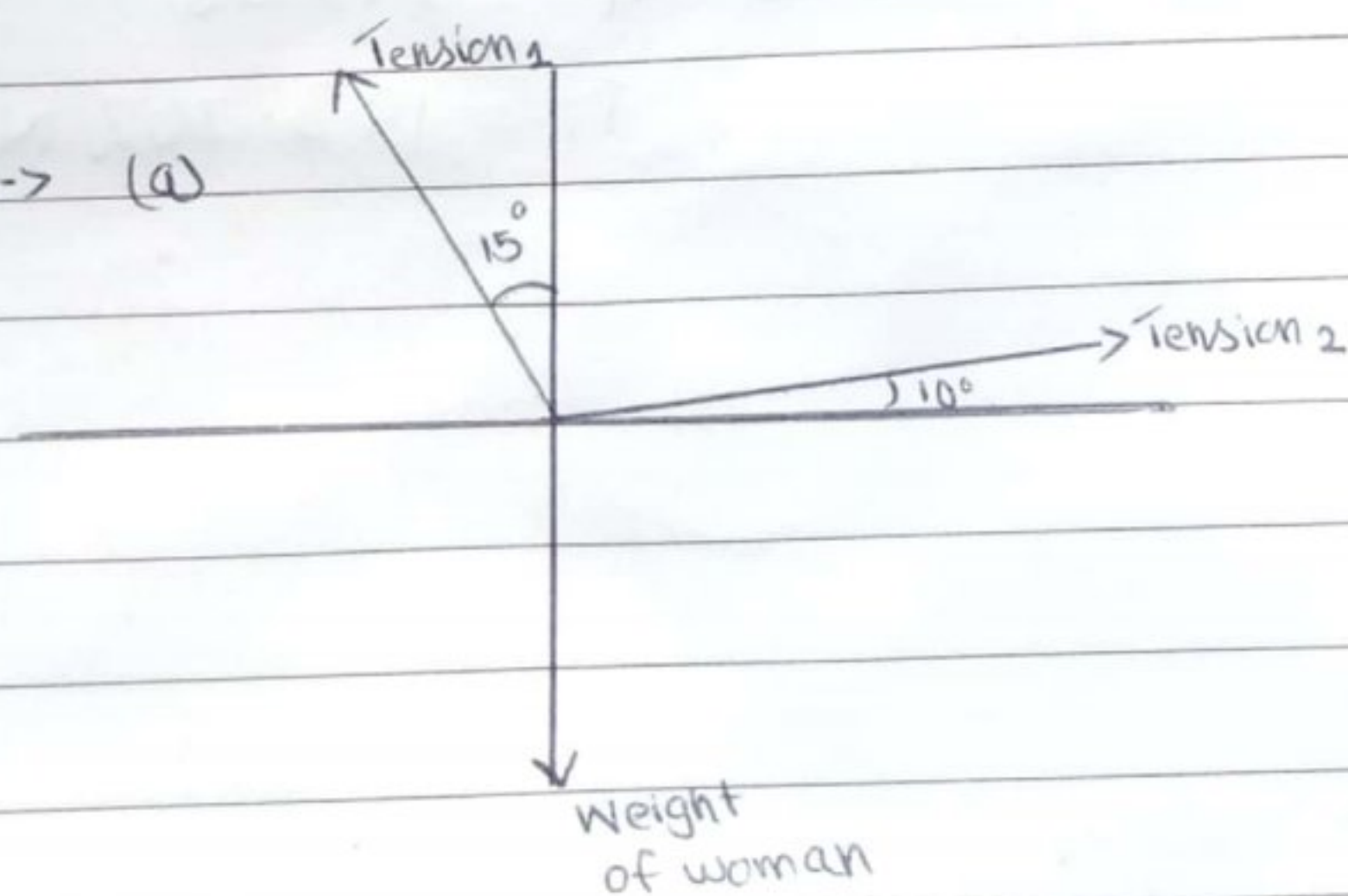
2-→ 700 N

$$3-→ F = ma$$

$$F = 2000 \times (200)$$

$$F = 4 \times 10^5 \text{ N}$$

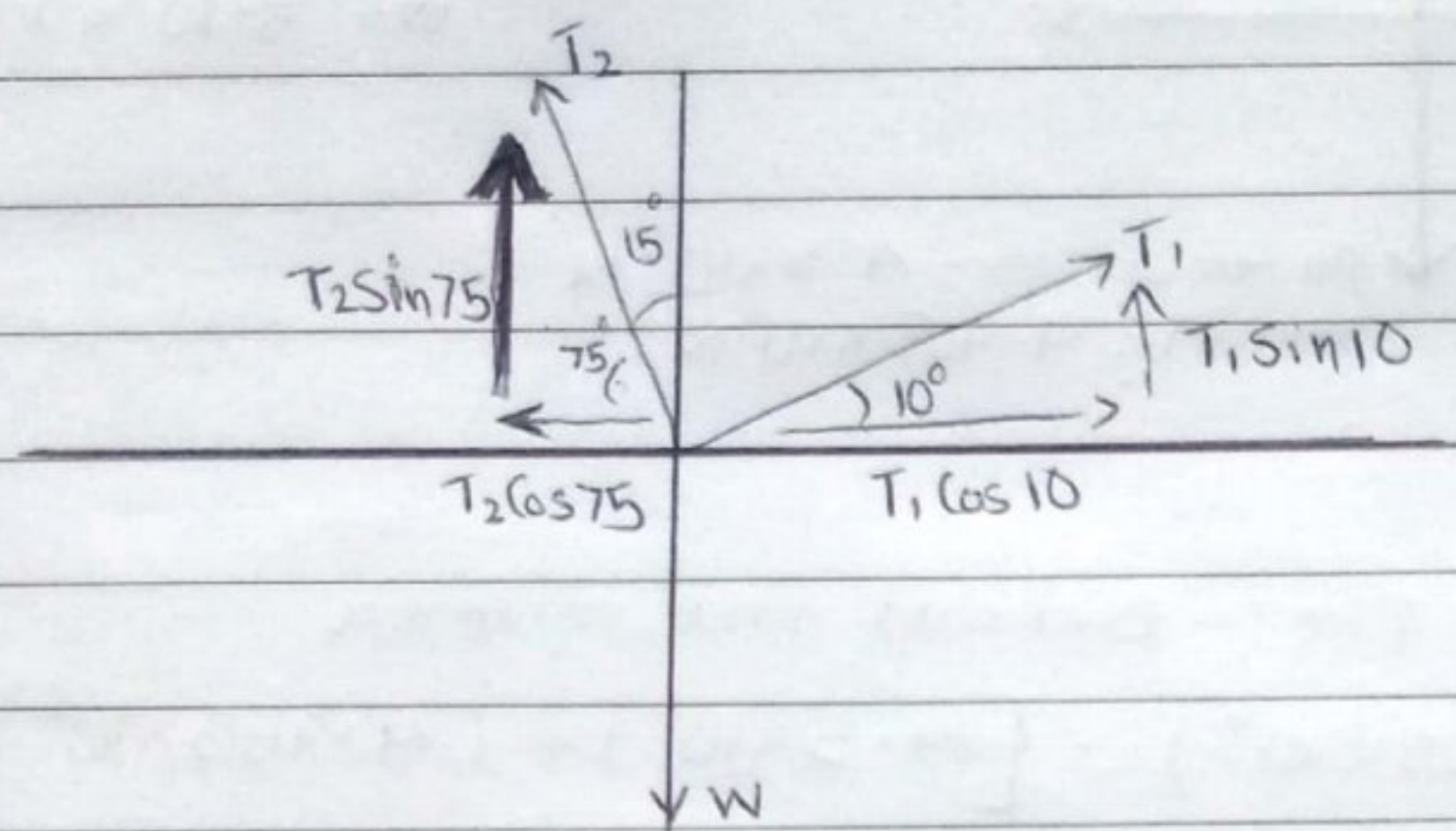
4-→ (a)



(b) $F_{\text{net},x} = ma_x$

(c) $F_{\text{net},y} = may$

(d)



\Rightarrow As the system is motionless it is in "equilibrium."

$$\left[\begin{array}{l} T_1 \sin 10 = T_2 \sin 75 \\ T_1 = T_2 \frac{\sin 75}{\sin 10} \end{array} \right]$$

$$w = mg$$

$$w = 76 \times 9.81 = 745.56 \text{ N}$$

eq(2)

eq(1) $T_2 \cos 75 = T_1 \cos 10$

$$T_2 = \frac{T_1 \cos 10}{\cos 75}$$

plug in

second eq

$$T_2 \sin 75 + T_1 \sin 10 = w$$

$$(T_1 \cdot 3.805) \sin 75 + T_1 \sin 10 = 745.56$$

$$T_1 \cdot 3.6753 + T_1 \cdot 0.1736 = 745.56$$

$$3.849 T_1 = 745.56$$

$$T_1 = 193.702 \text{ N}$$

Now finding T_2

$$T_2 = T_1 \frac{\cos 10}{\cos 75}$$

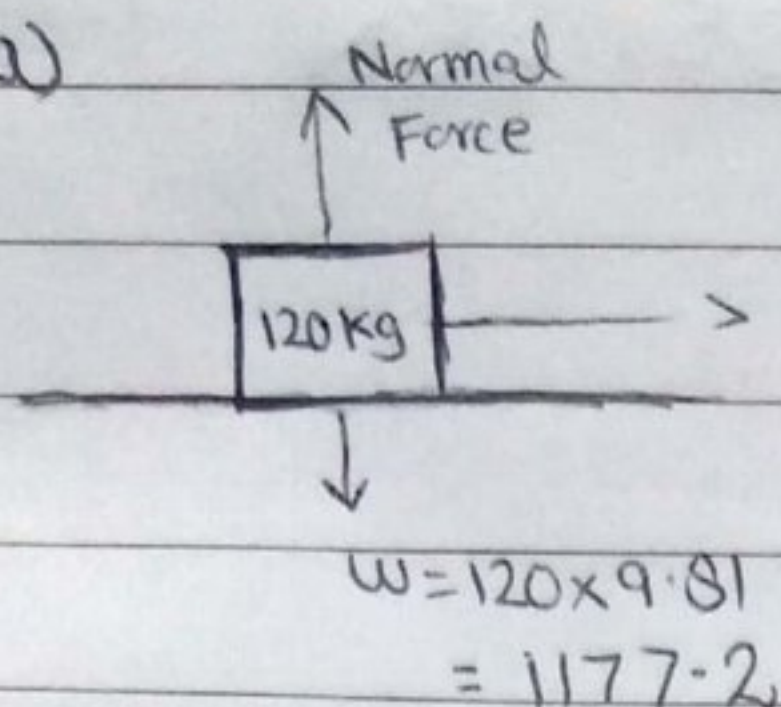
$$T_2 = 193.702 \times \frac{\cos 10}{\cos 75}$$

$$T_2 = 737.029 \text{ N}$$

Excellent work

Ex Ch-5

1 → (a)



$$F_N + W = 0$$

$$\therefore F_N - 1177.2 = 0$$

$$F_N = 1177.2 \text{ N}$$

$$F_N = W$$

$$F_s \leq \mu N$$

$$F_s = 0.5 \times 1177.2$$

$$F_s = 588.2 \text{ N}$$

(b) $F_k = \mu_k N$

$$F_k = 0.3 \times 1177.2$$

$$F_k = 353.16 \text{ N}$$

$$F_{\text{net}} = ma$$

$$a = \frac{F_{\text{net}}}{m} = \frac{588.2 - 353.16}{120} = 1.959 \text{ m/s}^2$$

2 → • $\sin 25 = \frac{w_{\parallel}}{w}$

$$\cos 25 = \frac{w_{\perp}}{w}$$

• $N = w_{\perp} = w \cos 25$

$$F_k = 0.1 w \cos 25$$

$$F_{\text{net}} = ma$$

$$w (\sin 25 - 0.1 \cos 25) = ma$$

$$a = g \times 0.3319$$

$$a = 3.2567 \text{ m/s}^2$$

$$3 \rightarrow F_D = \frac{1}{2} C_D A v^2$$

$$F_D = \frac{1}{2} \times 0.75 \times 1.225 \times 0.75 \times (40)^2 = 551.25 \text{ N}$$

4.→

$$F = mg$$

$$= 2300 \times 9.81$$

$$= 22563$$

$$A = \pi r^2$$

$$A = \pi \times (4 \times 10^{-2})^2$$

$$A = 5 \times 10^{-3} \text{ m}^2$$

$$\text{Young's modulus} = \frac{FL}{A \Delta x} = \frac{22540 \times 10}{5 \times 10^{-3} \times 3 \times 10^{-3}} = 1.5 \times 10^{10} \text{ N/m}^2$$

Ch-6

$$1 \rightarrow \omega = \frac{v}{r} = \frac{144 \times 1000}{3600 \times 0.5} = 80 \text{ rad/s}$$

$$2 \rightarrow \tan \theta = \frac{v^2}{rg} = \frac{\left(\frac{120}{3600} \times 1000\right)^2}{0.9 \times 1000 \times 9.81} = 0.125$$

$$\theta = \tan^{-1}(0.125) = 7.1^\circ$$

3.→

$$F_c = F_N$$

$$\frac{mv^2}{R} = \mu_x F_N$$

$$\frac{m v^2}{R} = \mu_x mg$$

$$v^2 = \mu_x g R$$

$$v = \sqrt{\mu_x g R}$$

$$v_1 = \sqrt{1 \times 400 \times 9.81}$$

$$v_1 = 62.641839 \text{ m/s}$$

$$v_2 = \sqrt{1 \times 800 \times 9.81}$$

$$v_2 = 88.588 \text{ m/s}$$

Great job

4 -> ~~Q~~

$$(a) \quad a = \frac{Gm}{R^2} = \frac{6.67 \times 10^{-11} \times 1.4 \times 10^{22}}{(4.5 \times 10^{12})^2}$$

$$a = 4.6 \times 10^{-14} \text{ m/s}^2$$

$$(b) \quad a = \frac{Gm}{R^2} = \frac{6.67 \times 10^{-11} \times 8.62 \times 10^{25}}{(2.5 \times 10^{12})^2}$$
$$= 9.199 \times 10^{-10} \text{ m/s}^2$$

$$(c) \quad \frac{1^{\text{st}} a}{2^{\text{nd}} a} \neq \frac{2^{\text{nd}} a}{1^{\text{st}} a} = \frac{9.199 \times 10^{-10}}{4.6 \times 10^{-14}} = 1.99 \times 10^4$$

\Rightarrow acc due to gravity is 1.99×10^4 greater

(+2) Bonus, yay!