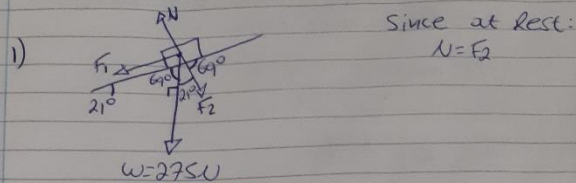


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(a) $g = 9.81 \text{ ms}^{-2}$ weight = mass $\times$ gravity

(i) $F_1 = 275 \times \cos(69) = \boxed{98.55N}$

(ii) The angle is 21°

(iii) $F_2 = 275 \times \cos(21) = 256.73$
Since $F_2 = N$
 $\Rightarrow \boxed{N = 256.73N}$

(b) Momentum = mass $\times$ Velocity

(i) $p = m \cdot v$

(ii) $\text{kg m/s or kg ms}^{-1}$

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(1302755)

(c) (i) Resultant Force = mass $\times$ acceleration
weight = mass $\times$ gravity

$\Rightarrow \text{mass} = \frac{\text{weight}}{\text{gravity}}$

$\Rightarrow m = \frac{275}{9.81}$

$\Rightarrow \boxed{m = 28.03}$

$\Rightarrow a = 2.5 \text{ ms}^{-2}$

$m = 28.03$

$\Rightarrow R.F. = (28.03)(2.5) = \boxed{70.08N}$

(ii) Momentum = mass $\times$ Velocity

~~$M = (28.03) \times (7.5)$~~

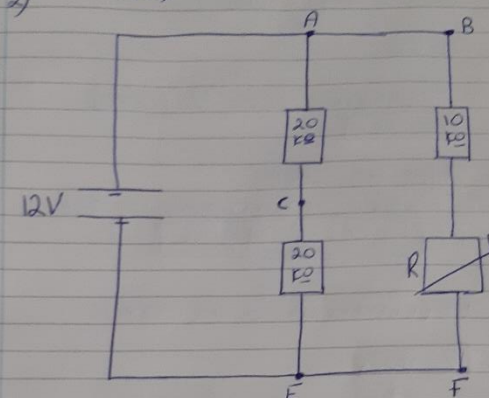
$\Rightarrow \boxed{p = 210 \text{ kg m/s}}$

$5 \text{ kg, } 12.5 \text{ ms}^{-1}, 3.2 \text{ s, } 7.5 \text{ ms}^{-1}$

(iii) $R.F. \Rightarrow \frac{5(7.5)}{3.2}$

$\boxed{R.F. = 11.72N}$

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(1302755)



(a) $R = 5000$

(i)

$20000 + 20000 = 40000$

$10000 + 5000 = 15000$

$\Rightarrow \frac{1}{40000} + \frac{1}{15000} = \frac{11}{120000}$

$\Rightarrow 12000 \div 11 = 10909.09 \Omega$

$\Rightarrow \boxed{T_R = 10909.09 \Omega \text{ or } 10.9 \text{ k}\Omega}$

(ii) $V = IR$

$\Rightarrow I = \frac{V}{R}$

$\Rightarrow I = \frac{12}{109 \text{ k}\Omega} \Rightarrow I = 1.100000092 \times 10^{-3} \text{ Amps}$

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(1302755)

(iii) Power = amps $\times$ volts

$\Rightarrow V = IR$

$\Rightarrow V = (1.100000092 \times 10^{-3})(20000)$

$\Rightarrow \boxed{V = 22V}$

$\Rightarrow \text{Volts to watts}$

$\Rightarrow \text{Power} = (1.100000092 \times 10^{-3})(22)$

$\Rightarrow \boxed{\text{Power} = 0.02 \text{ watts}}$

$\Rightarrow V = (1.100000092 \times 10^{-3})(10000)$

$\Rightarrow \boxed{V = 11V}$

$\Rightarrow \text{Power} = (1.100000092 \times 10^{-3})(11)$

$\Rightarrow \boxed{P = 0.01 \text{ watts}}$

$\Rightarrow V = (1.100000092 \times 10^{-3})(5000)$

$V = 5.5V$

$\Rightarrow P = (1.100000092 \times 10^{-3})(5.5)$

$\Rightarrow \boxed{P = 6.05 \text{ watts}}$

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b) Thevenin theorem:

$$V \left(\frac{R_1}{R_1 + R_2} \right)$$

(i) $12 \left(\frac{20}{20+20} \right) = \boxed{6V}$

(ii) $12 \left(\frac{5}{10+5} \right) = \boxed{4V}$

$6 + 4 = 10V$

(iii) $12V - 10V = 2V$
 $\Rightarrow \boxed{C-D = 2V}$

3)

(a)
 The moment of a Force about a point is equal to the Force multiplied by the perpendicular distance between the line of action of the Force and the pivot.

(b)

(i) $M = F \times d = 250 \times 48 \times 10^{-3} = 12 Nm$

(ii) Equilibrium $\Rightarrow CWL = ACWL$
 $\Rightarrow F \times 27 \times 10^{-3} = 12$
 $\Rightarrow F \times 27 = 12$
 $\Rightarrow F = \frac{12}{27 \times 10^{-3}}$
 $\Rightarrow \boxed{F = 444.4 N}$

(iii) $F = kx$
 $\Rightarrow k = \frac{F}{x} \Rightarrow k = \frac{444.4}{15 \times 10^{-3}} = \boxed{30 kNm^{-1}}$

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(v) $Workdone = \overset{(Fx)}{Force} \times distance$

$$W = \frac{1}{2} Fx \Rightarrow \frac{1}{2} (444.4 \times 15 \times 10^{-3}) = \boxed{3.3 J}$$

(c)

(i) $Power = \frac{Energy}{Time}$

$$\Rightarrow \boxed{W = \frac{J}{s}}$$

(ii) $T = 2.25 \text{ seconds}$
 $E = 3.3 J$

$$\Rightarrow P = \frac{3.3}{2.2} = \boxed{1.5 \text{ Watts}}$$

(d) $3.2 kJ \rightarrow 3200 J$
 Energy per squeeze = 3.3 J

$$\Rightarrow \frac{3200}{3.3} = 969.69$$

The Tiger will be squeezed 970 times

Romylos Frangos 1802755

This work belongs to Romylos Frangos, I spend a lot of time doing it and I put a lot of effort to it.