Midterm #2

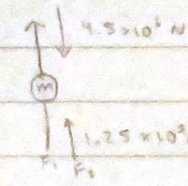
Melissa M.
11/20/2022

Score: 18/20

Chapter 4

1.)

a.)



F_r = rocket, 5×10^5 kg

b.) $F = T - f - mg$

$ma = F$

$ma = T - f - mg$

$5 \times 10^5 kg(a) = 1.25 \times 10^7 N - 4.5 \times 10^6 N - 5 \times 10^5 kg(9.8)$

$a = \frac{1.25 \times 10^7 N - 4.5 \times 10^6 N - 4.9 \times 10^6 N}{5 \times 10^5 kg}$

$\boxed{a = 6.20 m/s^2}$

2.) $\boxed{-700N}$

3.) $a = -200 m/s^2$

$F = ma$

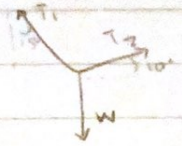
$F = 2000 * (-200)$

$1000N = 2000kg \times (-200 m/s^2)$

$= \boxed{4 \times 10^5 N}$

4)

a)



b.) $\boxed{F_{NETx} = T_2(\sin 10° * T_2 \cos 15 - w}$

c.) $\boxed{F_{NETy} = T_2(\cos 10° - T_1 \sin 15°)}$

d.) $F_{NET} = 0 = T_1 \cos 75° = T_2 \sin 10°$

$\frac{T_2 \cos 10}{\cos 75} \times \sin 75 + T_2 \sin 10 - (9.81 \times 76)$

$T_2 = 194N \rightarrow T_1 = \frac{194 \times \cos 10}{\cos 75} = \boxed{738N = T_1}$

Chapter 5

1)

a) $f = \mu N$ $N = mg$

$f = M \cdot mg$

$f = .5 \times 120 \times 9.81$

$\boxed{f = 588N}$

b) $f = .3 \times 120 \times 9.81$

$f = 352N$

$F_{NET} = ma$

$f_k - f_s = ma$

$ma = 588N - 352N$

$ma = \frac{236N}{120kg}$

$\boxed{a = 1.96 m/s^2}$

2) $f_k = 0.1$

25°

$f_n = 0.1(w_y)ma$

$f_n = (0.1 \cos 10 + \sin 10)\, 9.81$

$= 1.677$

.175 − .098

$a = .77\ m/s^2$ (-1)

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

$F_D = \frac{1}{2}(.75)(1.225\ kg/m^3)(.75\ m^2)(40\ m/s)^2$

$= .344 \times 1600$

$= 550.4N$

Chapter 6

1.) 144km r = .5m = .0005km

$w = \frac{144km}{.0005km} = 288{,}000 \times \frac{1hr}{3600s} = \frac{80\ rads}{secs}$

2) 0.9km rad 120km × $\frac{1000m}{1km}$ × $\frac{1hr}{3600s}$ = 33.3 m/s

v = 12s .9km × 1000 = 900m

$\tan\theta = v^2/rg$

$\tan\theta = \frac{33.3^2}{900m \times 9.81} = \frac{1108.8}{8829} = .125 \tan^{-1}$

$\theta = 7.12°$

Well done!

3.) a.) Path 2

b) Path 1 : 400m = r

$Mg = v^2 \cdot 1$

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

$v_1 = 63 m/s$

Path 2

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

$v_2 = 89 m/s$

4.) 2300kg length = 10m r = 4cm = .04m (2,300,000m)

decrease 3mm = .003m

$Y = \frac{mgL}{\pi r^2 \Delta l}$

$Y = \frac{2{,}300Kg \times 9.81 \times 10m}{\pi(.04m)^2 \cdot .003m}$

$Y = \frac{225{,}630}{.0502}$

$Y = 4.49 \times 10^6\ N/m^2$

(-1) it's 10^9