

# Midterm #2

Melissa M.  
11/20/2022

## Chapter 4

1.)  $4.5 \times 10^4 \text{ N}$  = air resistance

a.)



$$F_r = 1.25 \times 10^3 \text{ N}$$

$F_s = \text{rocket}, 5 \times 10^5 \text{ kg}$

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

$$5 \times 10^5 \text{ kg}(a) = 1.25 \times 10^3 \text{ N} - 4.5 \times 10^4 \text{ N}$$

$$ma = F$$

$$- 5 \times 10^5 \text{ kg}(9.8)$$

$$ma = T - f - mg$$

$$a = \frac{1.25 \times 10^3 \text{ N} - 4.5 \times 10^4 \text{ N} - 4.9 \times 10^6 \text{ N}}{5 \times 10^5 \text{ kg}}$$

$$5 \times 10^5 \text{ kg}$$

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

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

3.)  $a = -200 \text{ m/s}^2$

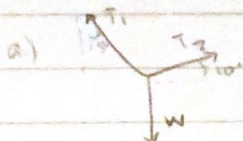
$$F = ma$$

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

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

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

4.)



$$b) F_{\text{net}x} = T_2(\sin 10^\circ) + T_1 \cos 15^\circ - w$$

$$c) F_{\text{net}y} = T_2(\cos 10^\circ) - T_1 \sin 15^\circ$$

$$d) F_{\text{net}} = 0 = T_1 \cos 75^\circ = T_2 \sin 10^\circ$$

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

$$T_2 = 194 \text{ N} \rightarrow T_1 = \frac{194 \cos 10}{\sin 75} = 738 \text{ N} = T_2$$

## Chapter 5

1.)

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

$$f = \mu \cdot mg$$

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

$$f = 588 \text{ N}$$

$$b) f = .3 \times 120 \times 9.81 \quad F_{\text{net}} = ma$$

$$F_w = 352 \text{ N}$$

$$F_u - F_s = ma$$

$$ma = 588 \text{ N} - 352 \text{ N}$$

$$ma = 236 \text{ N}$$

$$120 \text{ kg}$$

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



2)  $f_k = 0.1$

$25^\circ$

$f_k = 0.1(w_y) \sin \theta$

$f_k = (0.1 \times \cos 10 + \sin 10) 9.81$

$= 1.672$

$.175 = .095m$

$a = .77 m/s^2$

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

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

$= .344 \times 1600$

$= 550.4 N$

4)  $2300 ng$  length =  $10 m$   $r = 4 cm$   
decrease  $3 mm = .003 m$   $\approx .04 m$

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

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

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

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

## Chapter 6

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

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

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

$v = 125$

$.9 km \times 1000 = 900 m$

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

$\tan \theta = \frac{33.3^2}{900 m \times 9.81} = \frac{1,108.89}{8,829} = .125 \tan^{-1}$

$\theta = 7.12^\circ$

3) a) Path 2

b) Path 1:  $400 m = r$

$Mg = v^2 \cdot 1$

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

$v_1 = 63 m/s$

Path 2

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

$v_2 = 89 m/s$