

**Motion with Thrust**

**Calculate acceleration “a”**

∑Fy = ma = F-w = may

W = m\*g

M = w/g

V0 = 0

g = 9.8 m/s2

a = (F-w)÷m

a = g\*[(F-w)÷w]÷g

a = [(90-50)÷50]\*9.81

a = 7.848 m/s2

**Velocity from 0 < t < 3s**

Vt = at

= 7.848\*3 = 23.544 m/s

**Position of the rocket from** **0 < t < 3s**

Y1 = y0 + v0 + 0.5\*a\*t2

Yt = 0.5\*a\*t2 = 44.145 m

**Motion with No thrust**

a = g = 9.81 m/s2

Velocity

Vt2 = v0 + at

Vt2 = 23.544 – 9.81t

At maximum height, vt = 0

0 = 23.544 – 9.81t

t = 23.544÷9.81 = 2.4s

**Find the time when the rocktet reachs the highest point**:

Tt = 3 s + 2.4s = 5.4s

**Distance travel by the rocket from** **3s < t < 5.4s**

**Yt2 =** y0 + v0t + 0.5\*g\*t2

Yt2 = 44.145 + 23.544t – 4.905t2

Y2.4 = 72.40 m

**Total distance Td = Tt + Tt2**

Td = 116.54 m

clear all

% Step 1: Declare some constants and spaces

F = 90; % Thrust force is 90 N

W = 50; % Rocket weight is 50 N

g = 9.81; % Gravity is 9.8/m^s

m = W/g; % Calculate the mass

Num = 100; % Declare 100 time steps

a = (F-W)/m; % Calculate the acceleration

v = zeros(1,Num ); % Declare a space to store velocity

dis = zeros(1,Num ); % Declare a space to store displacement

% Step 2: Find the time when the rocktet reachs the highest point

Time\_End = 5.4; %Time\_End is the time when the rocket reachs the highest point

t = linspace(0,Time\_End,Num ); % Declare a space to store displacement

% Step 3: Code the velocity before and after 3 seconds until it reach the

% highest point

for i = 1:Num

time = t(1,i);

end

% Step 4: Plot

subplot(2,1,1)

plot(t,v)

grid

xlabel('time(s)')

ylabel('velocity(m/s)')

title('velocity VS time')

xlim([0 5.4])

subplot(2,1,2)

plot(t,dis)

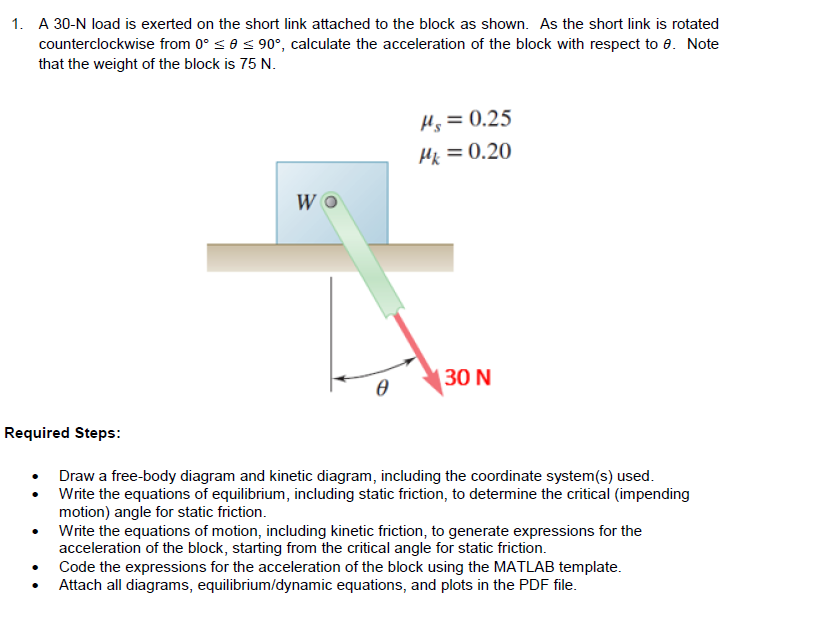
grid

xlabel('time(s)')

ylabel('displacement(m)')

title('displacement VS time')

xlim([0 5.4])



**Block Motion impeding**

**Calculate the critial value for the block to slide**

∑Fx = 0

= 30sin𝜃-f = 0

Sin𝜃 = f/30 = 0.25\*N/30

∑Fy = 0

= N-w-30cos𝜃 = 0……………………………..N = w + 30cos𝜃 (1)

Cos𝜃 = (N-w)/30

We know that Sin2𝜃 + cos2𝜃 = 1

(0.25\*N/30)2 + [(N-w)/30]2 = 1

(0.0625/900)N2 + (N2-150N+5625) = 1

(1.0625N2-150N+5625) = 1

(1.0625N2-150N+5625) = 900

1.0625N2-150N+4725 = 0 Solving this equation give

N = 93.73 or N = 47.44

Sin𝜃 = 0.25\*N/30 we plug in the values of N which is greater than the weight (75lb)

Sin𝜃 = 0.25\*93.73/30 = 0.7810

Sin-1(0.7810) = 51.36°

The critical angle is 51.36°

**Block Motion impeding**

∑Fx = ma

= 30sin𝜃-f = 30sin𝜃 – 0.2N = m\*a m = w/g

∑Fy = 0

= N-w-30cos𝜃

N = w + 30cos𝜃

**Calculate the acceleration before and after the critial degree** **0° ≤ 𝜃 ≤ 90°**

a = g = \*9.81

clear all

% Step 1: Declare some constants and spaces

u\_k = 0.2; % Kintic friction constant

Weight = 75; % Weight of the block is 75 N

Mass = Weight/9.81; % calculat the mass

Num = 100000; % Create 100000 points for the angle space from 0 to 90 degree

degree = linspace(0,90,Num); % Declare a degree space for 30 N to rotate

a = zeros(1,Num); % Declare an acceleration space

%Step 2: Calculate the critial value for the block to slide

% Critial is the critial angle for the block to slide

Critial = ;

%Step 3: Calculate the acceleration before and after the critial degree

%until it reach to 90 degree

for i =1:Num

theta = degree(1,i);

if theta<Critial || theta==Critial

a(1,i)=

end

if theta>Critial

a(1,i)=

end

end

plot(degree,a)

grid

xlabel('degree')

ylabel('acceleration(m/s^2)')

title('acceleration VS degree')