

```
clear;clc;
```

Loading mat files

```
load('constants.mat');  
load('kinematic_data.mat')  
load('force_data.mat');
```

Calling the function Prob2 to get desired outputs

```
[T1, T2, T3, err_Fx_3, err_Fy_3, err_T3] = HW06_Function(theta1,theta2, ...  
    thetadot1,thetadot2,thetadotdot1,thetadotdot2,GRF_hori,GRF_vert);
```

Necessary moment arms of muscles

```
ham_hip_ext_mom_arm = 0.05; % in m  
ham_knee_flex_mom_arm = 0.04; % in cm  
vasti_knee_ext_mom_arm = 0.04; % in cm  
soleus_ankle_ext_mom_arm = 0.025; % in cm
```

Forces calculated in the hamstrings, vasti, and soleus muscles

```
F_ham_hip_ext = -T3/ham_hip_ext_mom_arm;  
F_ham_knee_flex = T2./ham_knee_flex_mom_arm;  
F_vasti_knee_ext = (T2+F_ham_knee_flex*ham_knee_flex_mom_arm)/...  
vasti_knee_ext_mom_arm;  
F_soleus_ankle_ext = -T1/soleus_ankle_ext_mom_arm;
```

Accounting for only positive muscle forces

```
F_ham_hip_ext = F_ham_hip_ext(F_ham_hip_ext>=0);  
index1 = find(F_ham_hip_ext>=0);  
  
F_ham_knee_flex = F_ham_knee_flex(F_ham_knee_flex>=0);  
index2 = find(F_ham_knee_flex>=0);  
  
F_vasti_knee_ext = F_vasti_knee_ext(F_vasti_knee_ext>=0);  
index3 = find(F_vasti_knee_ext>=0);  
  
F_soleus_ankle_ext = F_soleus_ankle_ext(F_soleus_ankle_ext>=0);  
index4 = find(F_soleus_ankle_ext>=0);
```

Plots of Net Joint Torques at Ankle, Knee and Hip

```
plot(time, T1)  
hold on  
plot(time, T2)  
hold on  
plot(time, T3)  
xlabel('Time (seconds)')  
ylabel('Net Joint Torques (Newton-m)')  
h1 = legend('T1: Ankle', 'T2: Knee', 'T3: Hip');  
rect = [0.15, 0.60, .30, .30];
```

```

set(h1, 'Position', rect);
title('Net Joint Torque vs Time')
grid on

```

Plot of error in Fx\_3 and Fy\_3

```

figure
plot(time, err_Fx_3)
hold on
plot(time, err_Fy_3)
xlabel('Time (seconds)')
ylabel('Error (Newton)')
title('Error in component of forces vs Time')
legend('Error in Fx_3', 'Error in Fy_3')
grid on

```

Plot of error in Net Joint Torque at Hip

```

figure
plot(time, err_T3)
xlabel('Time (seconds)')
ylabel('Error (Newton-m)')
title('Error in T3 vs Time')
grid on

```

Plot of forces developed in muscles

```

figure
plot(time(index1), F_ham_hip_ext)
hold on
plot(time(index2), F_ham_knee_flex)
hold on
plot(time(index3), F_vasti_knee_ext)
hold on
plot(time(index4), F_soleus_ankle_ext)
xlabel('Time (seconds)')
ylabel('Force (Newton)')
h2 = legend('Hamstring Hip Extension', 'Hamstring Knee Flexion', ...
            'Vasti Knee Extension', 'Soleus Ankle Extension');
rect = [0.15, 0.60, .30, .30];
set(h2, 'Position', rect);
title('Muscle Force vs Time')
grid on

```