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Roshan Jaiswal-Ferri

```
%Section - 01
%Aero 421 HW1: 4/2/25
```

Workspace Prep

```
%warning off
format long          %Allows for more accurate decimals
close all;           %Clears all
clear all;            %Clears Workspace
clc;                  %Clears Command Window
```

Total Mass

```
scm = 20; %solar cell mass kg
sensorm = 100; %mass of sensor in kg
ms = 500; %kg MehielSat mass

total_mass = (2*scm) + sensorm + ms;
```

Detumble Mode

```
%These calculations assume a constant mass distrobution while in the
%detumble mode, disregarding that the components are tucked away in
%different spots
```

```
% Center of Mass
```

```
com_xd = 0; %com = center of mass
com_yd = 0;
com_zd = 0;
```

```
comd = [com_xd, com_yd, com_zd];
```

```
% Moment of Inertia
```

```
a = 2; %side length in m
Icubed = (1/6)*(total_mass*a^2);
```

```

% parrallel axis theorem I + md^2
Ixxd = Icubed;
Iyyd = Icubed;
Izxd = Icubed;

Ixyd = 0;
Ixzd = 0;
Iyxd = 0;

Iyxd = Ixyd;
Izxd = Ixzd;
Izyd = Iyxd;

Id = [Ixxd, Ixyd, Ixzd;...
      Ixyd, Iyyd, Iyxd;...
      Ixzd, Izyd, Izxd];

```

Normal Operations

```

% Center of Mass

com_x = 0; %com = center of mass
com_y = 0;
com_z = (sensorm*(1+0.5))/total_mass;

com = [com_x, com_y, com_z];

% Moment of Inertia
a = 2; %side length in m
Icube = (1/6)*(ms*a^2);

Ipanlx = (1/12)*scm*((3^2)+(0.05^2)); %eq: 1/12*m*(h^2 + w^2)
Ipanly = (1/12)*scm*((0.05^2)+(2^2));
Ipanlz = (1/12)*scm*((3^2)+(2^2));

Isensx = (1/12)*sensorm*((0.25^2)+(1^2));
Isensy = (1/12)*sensorm*((0.25^2)+(1^2));
Isensz = (1/12)*sensorm*((0.25^2)+(0.25^2));

% parrallel axis theorem I + md^2
Ixx = (Icube + ms*com(3)^2) + 2*(Ipanlx + scm*((com(3)^2)+(2.5^2)))...
      + (Isensx + sensorm*(1.5-com(3))^2);
Iyy = (Icube + ms*com(3)^2) + 2*(Ipanly + scm*com(3)^2)...
      + (Isensy + sensorm*(1.5-com(3))^2);
Izz = (Icube) + 2*(Ipanlz + scm*2.5^2) + (Isensz);

Ixy = 0;
Ixz = 0;
Iyz = -2*scm*com(3)*2.5;

Iyx = Ixy;
Izx = Ixz;
Izy = Iyz;

```

```
I = [Ixx, Ixy, Ixz;...
     Iyx, Iyy, Iyz;...
     Izx, Izy, Izz];
```

Display Results

```
disp('Results for Detumbled')
disp(['Total Mass: ', num2str(total_mass)]);
disp(['Center of Mass: ', num2str(comd)]);
disp(' ')
disp(num2str(Id))
disp('-----')

disp('Results for Normal')
disp(['Total Mass: ', num2str(total_mass)]);
disp(['Center of Mass: ', num2str(com)]);
disp(' ')
disp(num2str(I))
```

```
Results for Detumbled
Total Mass: 640
Center of Mass: 0  0  0
```

```
426.6667      0      0
      0    426.6667      0
      0      0    426.6667
```

```
-----
Results for Normal
Total Mass: 640
Center of Mass: 0      0    0.23438
```

```
812.0396      0      0
      0    545.3729   -23.4375
      0   -23.4375    627.7083
```

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