

```
% Spring 2024 AER E 351 Homework 05 Problem 4.)6.6)
```

```
% Matthew Mehrrens
```

```
clear; clc; close all;
```

```
%% Given
```

```
m_0 = 15000; % [units]
```

```
m_L = 1000; % [units]
```

```
c = 3048; % [m/s]
```

```
m_s = 2000; % [units]
```

```
%% Part a.)
```

```
m_02 = (m_0^2 * m_L)^(1 / 3); % [units]
```

```
m_03 = m_02^2 / m_0; % [units]
```

```
lambda = m_02 / (m_0 - m_02); % [units]
```

```
%% Part b.)
```

```
syms m_s1 m_s2 m_s3;
```

```
eqn1 = m_03 * m_s1 - m_L * m_s1 == m_0 * m_s3 - m_02 * m_s3;
```

```
eqn2 = m_02 * m_s1 - m_03 * m_s1 == m_0 * m_s2 - m_02 * m_s2;
```

```
eqn3 = m_s1 + m_s2 + m_s3 == m_s;
```

```
sol = solve([eqn1,eqn2,eqn3],[m_s1,m_s2,m_s3]);
```

```
m_s1 = double(sol.m_s1); % [units]
```

```
m_s2 = double(sol.m_s2); % [units]
```

```
m_s3 = double(sol.m_s3); % [units]
```

```
epsilon = m_s1 / (m_0 - m_02); % []
```

```
%% Part c.)
```

```
syms m_p1 m_p2 m_p3;
```

```
eqn1 = m_0 == m_s1 + m_p1 + m_s2 + m_p2 + m_s3 + m_p3 + m_L;
```

```
eqn2 = m_02 == m_s2 + m_p2 + m_s3 + m_p3 + m_L;
```

```
eqn3 = m_03 == m_s3 + m_p3 + m_L;
```

```
sol = solve([eqn1,eqn2,eqn3],[m_p1,m_p2,m_p3]);
```

```
m_p1 = double(sol.m_p1); % [units]
```

```
m_p2 = double(sol.m_p2); % [units]
```

```
m_p3 = double(sol.m_p3); % [units]
```

```
%% Part d.)
```

```
Z = (1 + lambda) / (epsilon + lambda); % []
```

```
deltav = c * log(Z); % [m/s]
```

```
%% Output
```

```
fprintf( ...
```

```
    "Problem 4.)6.6.)a.)\n" + ...
```

```
    "m_02 = %g units\n" + ...
```

```
    "m_03 = %g units\n" + ...
```

```
    "lambda = %g\n\n", ...
```

```
    m_02, m_03, lambda);
```

```
fprintf( ...
```

```
    "Problem 4.)6.6.)b.)\n" + ...
```

```
    "m_s1 = %g units\n" + ...
```

```
    "m_s2 = %g units\n" + ...
```

```
    "m_s3 = %g units\n" + ...
```

```
    "epsilon = %g\n\n", ...
```

```
    m_s1, m_s2, m_s3, epsilon);
```

```
fprintf( ...
```

```
    "Problem 4.)6.6.)c.)\n" + ...
```

```
    "m_p1 = %g units\n" + ...
```

```
"m_p2 = %g units\n" + ...  
"m_p3 = %g units\n\n", ...  
m_p1, m_p2, m_p3);  
fprintf( ...  
"Problem 4.)6.6.)d.)\n" + ...  
"Z = %g\n" + ...  
"deltav = %g m/s\n", ...  
Z, deltav);
```