```
clc
clear
close all
g = (60000000)
```

```
g = 60000000
```

```
%Resultant Stiffness Matrix

K = [0.169,0.0256 , -26 , 26 ; 0.0256 , 0.005 , -3.9 , 3.9 ; -26 , -3.9 , g, 0 ; 26 , 3.9 , 0 ,
```

```
K = 4×4
10^7 ×
    0.0000    0.0000   -0.0000    0.0000
    0.0000    0.0000   -0.0000    0.0000
   -0.0000   -0.0000    6.0000         0
    0.0000    0.0000         0    6.0000
```

```
M_p = [0.0020, 0.0092,0.0182 ; 0.0092 , 0.0429 , 0.0853 ; 0.0182 , 0.0853, 0.1711]
```

```
M_p = 3×3
    0.0020    0.0092    0.0182
    0.0092    0.0429    0.0853
    0.0182    0.0853    0.1711
```

```
%Resultant Mass Matrix
M_p_r = 0.671 *M_p
```

```
M_p_r = 3×3
    0.0013    0.0062    0.0122
    0.0062    0.0288    0.0572
    0.0122    0.0572    0.1148
```

```
L = 100 * 10^(-3)
```

```
L = 0.1000
```

```
width = 10 * 10^(-3)
```

```
width = 0.0100
```

```
E = 62 * 10^(9)
```

```
E = 6.2000e+10
```

```
% thickness of the beam
t = 0.4 * 10^(-3)
```

```
t = 4.0000e-04
```

```
% Peizoelectric Coefficcent
e31 = -6.5 * 10^(8)
```

```
e31 = -650000000
```

```
% Moment of Inertia (I)
I = 1/12 * width * (t^(3))
```

```
I = 5.3333e-14
```

```
syms e
K_eig = eig(K)
```

```
K_eig = 4×1
10^7 ×
    0.0000
    0.0000
    6.0000
    6.0000
```

```
K_eig_vector = [K_eig(1,1) , 0 , 0, 0 ; 0, K_eig(2,1), 0, 0 ; 0, 0, K_eig(3,1) , 0 ; 0, 0 , 0 ,
```

```
K_eig_vector = 4×4
10^7 ×
    0.0000         0         0         0
         0    0.0000         0         0
         0         0    6.0000         0
         0         0         0    6.0000
```

```
K_eig_vector_sqrt = sqrtm(K_eig_vector)
```

```
K_eig_vector_sqrt = 4×4
10^3 ×
    0.0000         0         0         0
         0    0.0004         0         0
         0         0    7.7460         0
         0         0         0    7.7460
```

```
M_eig = eig(M_p_r)
```

```
M_eig = 3×1
    0.0000
    0.0002
    0.1447
```

```
M_eig_vector = [M_eig(1,1) 0 0 ; 0 M_eig(2,1) 0 ; 0 0 M_eig(3,1)]
```

```
M_eig_vector = 3×3
    0.0000         0         0
         0    0.0002         0
         0         0    0.1447
```

```
M_eig_vector_sqrt = sqrtm(M_eig_vector)
```

```
M_eig_vector_sqrt = 3×3
    0.0036         0         0
         0    0.0150         0
         0         0    0.3804
```

```
F_1 = [(M_eig_vector_sqrt(1,1) + K_eig_vector_sqrt(1,1)) ; (M_eig_vector_sqrt(2,2) + K_eig_vect
```

```
F_1 = 4×1
10^3 ×
```

```
0.0000
0.0004
7.7463
7.7460
```