Finite Element method

Number of elements = 6
Density of Shaft = 7800
Element-1

Mass Matrix [M]1
0.000103   0.000052
0.000052   0.000103

Stiffness matrix [K]1
12723.45   -12723.45
-12723.45   12723.45

Element-2

Mass Matrix [M]2
0.000103   0.000052
0.000052   0.000103

Stiffness matrix [K]2
12723.45   -12723.45
-12723.45   12723.45

Element-3

Mass Matrix [M]3
0.000103   0.000052
0.000052   0.000103

Stiffness matrix [K]3
12723.45   -12723.45
-12723.45   12723.45

Element-4

Mass Matrix [M]4
0.000103   0.000052
0.000052   0.000103

Stiffness matrix [K]4
12723.45   -12723.45
-12723.45   12723.45

Element-5

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Mass Matrix [M]5
0.000103        0.000052
0.000052        0.000103

Stiffness matrix [K]5
12723.45        -12723.45
-12723.45       12723.45

Element-6
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Mass Matrix [M]6
0.000103        0.000052
0.000052        0.020103

Stiffness matrix [K]6
12723.45        -12723.45
-12723.45       12723.45

Global Mass matrix
0.000103        0.000052        0.000000        0.000000        0.000000
0.000000        0.000000
0.000052        0.000207        0.000052        0.000000        0.000000
0.000000        0.000000
0.000000        0.000052        0.000207        0.000052        0.000000
0.000000        0.000000
0.000000        0.000000        0.000052        0.000207        0.000052
0.000000        0.000000
0.000000        0.000000        0.000000        0.000052        0.000207
0.000052        0.000000
0.000000        0.000000        0.000000        0.000000        0.000052
0.000207        0.000052
0.000000        0.000000        0.000000        0.000000        0.000000
0.000052        0.020103

Global Stiffness matrix
1.27e+04        -1.27e+04       0.00e+00        0.00e+00        0.00e+00
0.00e+00        0.00e+00
-1.27e+04       2.54e+04        -1.27e+04       0.00e+00        0.00e+00
0.00e+00        0.00e+00
0.00e+00        -1.27e+04       2.54e+04        -1.27e+04       0.00e+00
0.00e+00        0.00e+00
0.00e+00        0.00e+00        -1.27e+04       2.54e+04        -1.27e+04
0.00e+00        0.00e+00
0.00e+00        0.00e+00        0.00e+00        -1.27e+04       2.54e+04
-1.27e+04       0.00e+00
0.00e+00        0.00e+00        0.00e+00        0.00e+00        -1.27e+04
2.54e+04        -1.27e+04
```

```
0.00e+00        0.00e+00        0.00e+00        0.00e+00        0.00e+00
-1.27e+04       1.27e+04
```

Fixed-Free Boundary condition

Natural frequencies:
320.658
3423.798
7032.746
11104.744
15696.043
20128.605

Eigen vector matrix
```
-0.2884   0.4997 -0.5773 0.5010  -0.2922 0.1059
0.4997   -0.5003 0.0015   0.4990  -0.5048 0.2115
-0.5772   0.0013 0.5773  -0.0039 -0.5796 0.3166
0.5002    0.4990  -0.0030 -0.5029 -0.4964 0.4209
-0.2895  -0.5010 -0.5773 -0.4971 -0.2778 0.5241
0.0012    0.0026  0.0045   0.0077  0.0166  0.6261
```

Normalised eigen vector matrix
```
0.1691   -0.5042 0.9962  -1.0000 0.9974  -0.4997
0.3378   -0.8709 0.9923   0.0026  -0.9987 0.8657
0.5057   -1.0000 -0.0077 1.0000   0.0026 -1.0000
0.6723   -0.8564 -1.0000 -0.0052 0.9961   0.8667
0.8372   -0.4792 -0.9884 -1.0000 -1.0000 -0.5015
1.0000    0.0287  0.0154   0.0077  0.0052  0.0021
```