

# ME324 - 2024 : Finite Element Analysis for Machine Design

## Week 4 (02.04.2024) – Problem Sheet

### 1. Analysing spring assembly using finite element method in MATLAB

Use MATLAB to develop suitable codes to analyse the given problems. Marks will be allocated for the clarity of the codes so they should be well-commented where necessary. Present the solution from MATLAB in a neat manner (do not just print the values without any description).

Following files should be submitted for each problem:

1. Do the calculations by hand. (Use your knowledge on matrix manipulations)
2. Well-commented MATLAB code. Submit .m files
3. Screenshots of the MATLAB code and the solution and the tabulated results

Copying will not be tolerated. Identical submissions will not be considered for grading.

For the spring assembly shown in Figure 1, determine the displacements at nodes 2, 3 and 4 and the reactions at nodes 1 and 5. Assume the rigid vertical bars at nodes 2, 3 and 4 connecting the springs remain horizontal at all times but are free to slide or displace left or right. There is an applied force at node 2 (P) of 1 kN to the right.

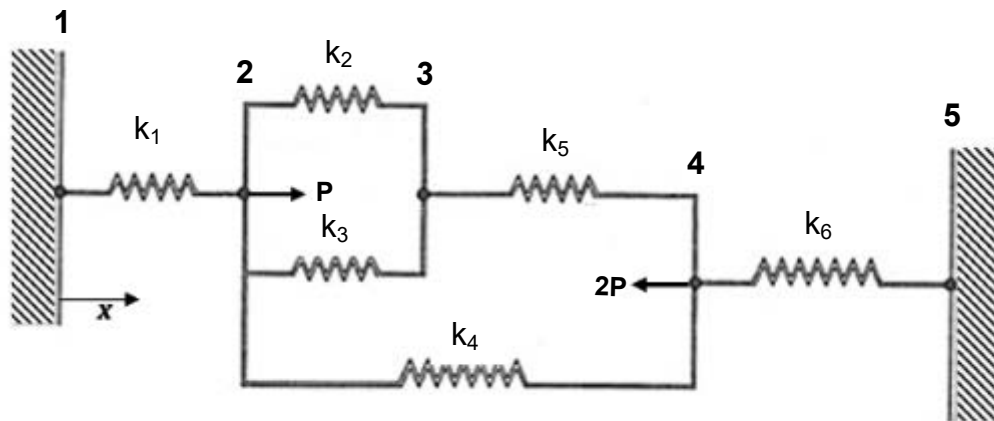


Figure 1: Spring Assembly

Let  $k_1 = (4+R1)*100$  N/mm,  $k_2 = k_3 = (3+R2)*100$  N/mm,  $k_4 = (2+R3)*100$  N/mm

$k_5 = (4+R2)*100$  N/mm,  $k_6 = (3+R3)*100$  N/mm

**R1 = Remainder of {(E No.)/2}**

**R2 = Remainder of {(E No.)/3}**

**R3 = Remainder of {(E No.)/4}**