



## Lab Assignment (1)

In the figure below, a resonator oscillates in the x axis. The oscillator thickness is  $t$ . The width of the springs is  $w$ . This system can be idealized as a lumped spring mass system, in which the total spring stiffness ( $K_x$ ) of the resonator can be calculated from the equation in the figure, where  $I$  is the area moment of inertial of the spring (can be calculated from the figure).

- A. Using ANSYS, find the force  $F_x$  to produce a displacement of  $40\ \mu\text{m}$ .
- B. Show a contour plot of the maximum displacement using ANSYS.
- C. Find the spring stiffness ( $K_x$ ) using the finite element modeling software ANSYS.
- D. Find the spring stiffness ( $K_y$ ) using the finite element modeling software ANSYS.

Note that:

- $F_x$  is applied at the middle point of the plate's right edge (as shown in figure).
- Poisson's ratio is 0.3 for the silicon
- The Young's modulus is 160 GPa.
- Use the dimensions according to the table below.

Group #	All Dimensions are in $\mu\text{m}$		
	t	w	L
1	2	2.0	400
2	2	2.1	410
3	2	2.2	420
4	2	2.3	430
5	2	2.4	440
6	2	2.5	450
7	2	2.6	460
8	2	2.7	470
9	2	2.8	480
10	2	2.9	490

