Name_____ Student number_____

Assignment 4

Consider the disk rigidity problem on page 1-4 of the lecture notes and the mass-displacement relationship given by dimension analysis

$$\frac{mgR^2}{Et^4} = f(\frac{u}{t}, \frac{L}{R}, \nu) \approx a(\frac{u}{t}) + b(\frac{u}{t})^3,$$

where the latter form uses the first two odd order terms of Taylor expansion of f with respect to u/t and, therefore, coefficients a and b may depend of L/R and ν. Instead of (expensive) physical experiments, one may use simulation by a model for finding, e.g., the dependency of the coefficients on L/R and ν. Use the mass-displacement table below, given by the course software with a large displacement plate model, to determine a and b when $E = 4.22\,\text{GPa}$, $R = 0.245\,\text{m}$, $L = 0.280\,\text{m}$, $t = 4.1\,\text{mm}$, and $g = 9.81\,\text{m/s}^2$. Also, use the outcome to estimate the values of the parameters for $\nu = 0.32$.

m [kg]	u [mm] ($\nu = 0.1$)	u [mm] ($\nu = 0.4$)
0	0.00	0.00
1	1.26	0.94
2	2.34	1.81
3	3.21	2.59
4	3.94	3.28
5	4.56	3.89
6	5.10	4.44
7	5.58	4.93