Name_____ Student number_____

Assignment 5

Consider the disk rigidity problem on page 1-4 of the lecture notes. First, measure the displacement of disks center point u as the function of mass m used as loading (page 1-5 of the lecture notes). Thereafter, use the mass-displacement data to find the coefficients a and b of relationship

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

The latter form uses the first two odd order terms of Taylor expansion of f with respect to u/t. The values of the geometrical and material parameters are $E = 4.22\,\mathrm{GPa}$, $\nu = 0.32$, $R = 0.245\,\mathrm{m}$, $L = 0.280\,\mathrm{m}$, $t = 4.1\,\mathrm{mm}$, and $g = 9.81\,\mathrm{m/s^2}$.

Experiment: The set-up is located in Puumiehenkuja 5L (Konemiehentie side of the building). The hall is open during the office hours (9-12 and 13-16) on Fri 12.01.2024. Place a mass on the loading tray and record the displacement shown on the laptop display. Disk material is not purely elastic so wait for the displacement reading to settle (almost). Gather enough mass-displacement data for finding the coefficients *a* and *b* reliably. For example, you may repeat a measurement with certain loading several times to reduce the effect of random error by averaging etc. You may also consider different loading sequences (like increasing and decreasing the mass) to minimize the effect of the viscous part of material response.