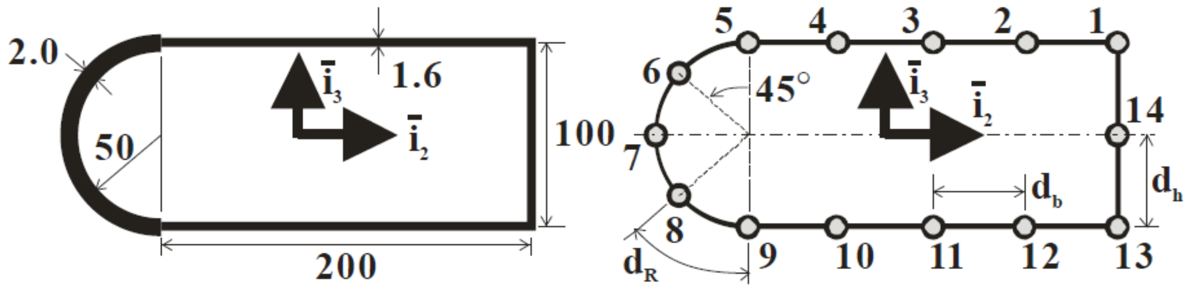
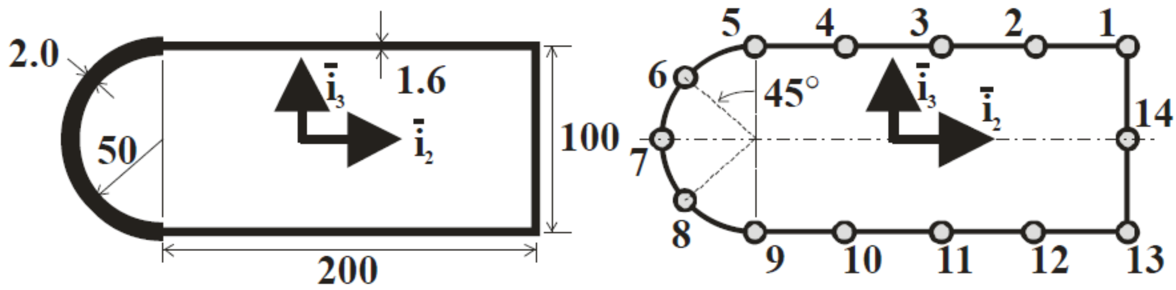
HW #4

Problem 8.66 Lumped sheet-stringer model



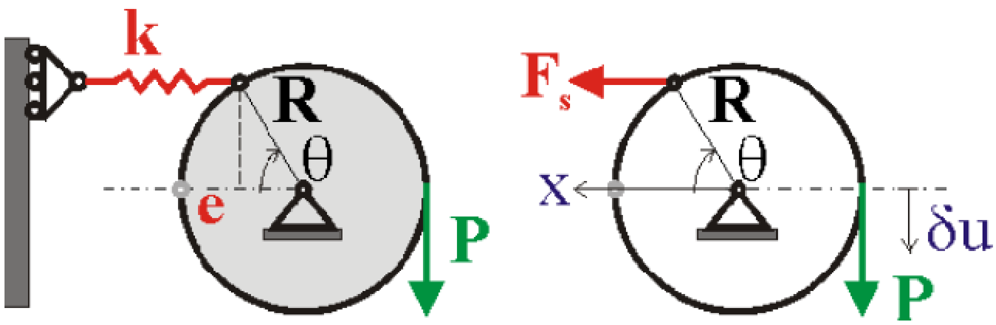
Construct a lumped sheet-stringer model for the thin-walled cross-section shown in fig. Assume that the stringers in the straight sections are spaced at 50 mm and at 45^0 in the curved portions. Assume the only loading is a moment, M2. All dimensions are in millimeters.

Problem 8.67 Torsional stiffness for closed section



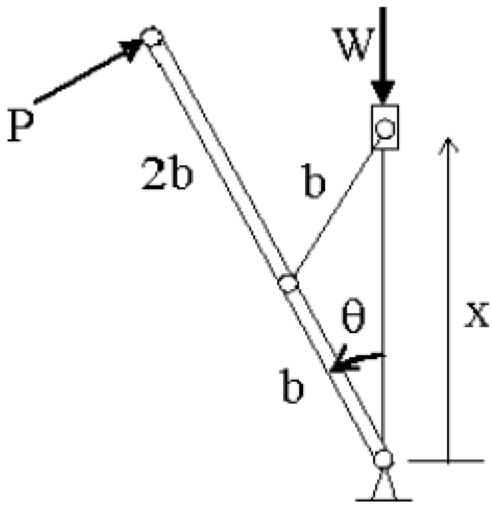
Determine the torsional stiffness, H11, for the idealized section shown in fig. Assume for this case that E = 210 GPa (steel) and that G = 30 GPa.

Problem 9.1 Rotating disk with spring restraint



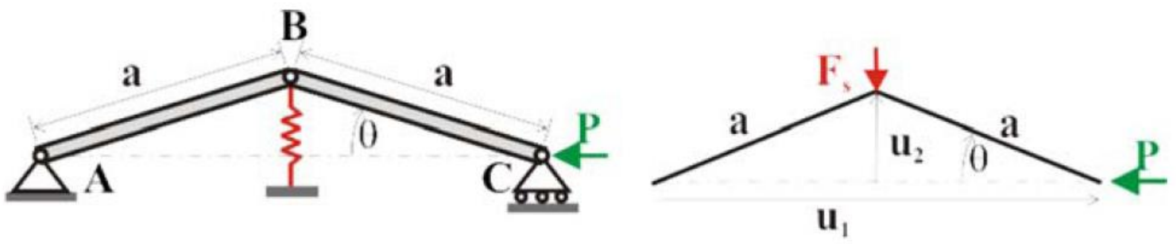
A mechanism consists of the rotating circular disk pinned at its center as shown in fig. A cable is wrapped around the outer edge and a force, P, is applied tangentially. The rotation is resisted by a spring of stiffness constant k attached to a pin on the disk's outer radius and fixed horizontally to a support that can move vertically, leaving the spring horizontal at all times. Use the principle of virtual work to determine the force, P, required to keep the disk in equilibrium as a function of disk angular position, θ.

Problem 9.5 Lever mechanism



A bar of length 3b is pinned at its lower end and supports a normal load, P, applied at its tip, as shown in fig. A second bar, of length b, is pinned to the first bar as shown and to a slider that is constrained to move vertically on a frictionless rod. A weight, W, is supported at the slider. Use the principle of virtual work to determine the force, P, required to keep the weight, W, in equilibrium as a function of angle θ.

Problem 9.11 Axially loaded pinned bars



Two rigid bars, AB and BC, are pinned together at appoint B, as shown in fig. The end of the first bar is pinned to the ground at point A, whereas the end of the other bar is constrained to slide horizontally at point C under the action of load P. A lateral spring of stiffness constant k is attached at point B. Angle θ between bar BC and the horizontal is the generalized coordinate used to define the system's configuration. Use the principle of virtual work to develop an expression for P = P(θ). From your analysis, identify the buckling load of the problem.