Problem : Work & Energy (approx. 40 min)

A linear elastic beam with bending stiffness *EI* is split in to two parts which are linked with a rotational spring with spring stiffness *r*. The beam is partially loaded with a distributed load *q* as indicated in the figure. All dimensions are also specified. Axial and shear deformation are neglected.

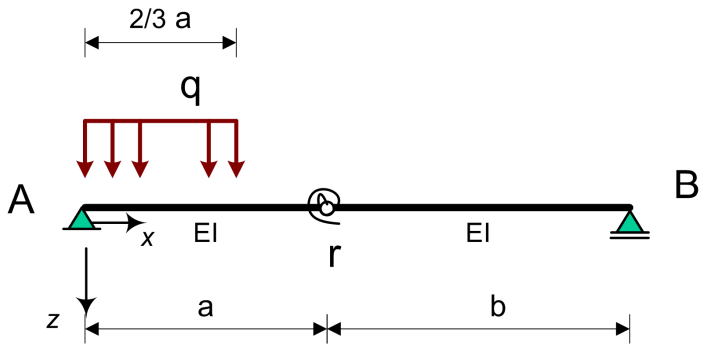

Figure 3 : Beam structure with rotational spring and (partially) distributed load.

Questions:

a) The value of the spring stiffness is of influence of the maximum moment in the structure?
b) Find the (absolute) value of the support reaction at A in kN.
c) Find the (absolute) value of the kink in the beam at the location of the spring in radians.
d) Find the amount of energy stored due to bending deformation in this structure in Joule.
e) Find the vertical displacement of the connection between the two beam parts using Castigliano's theoreme.