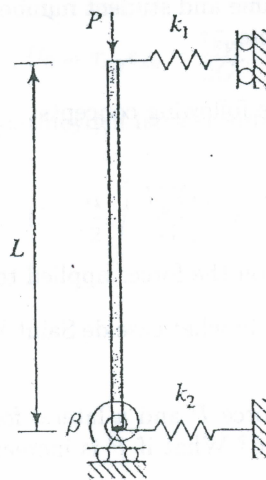


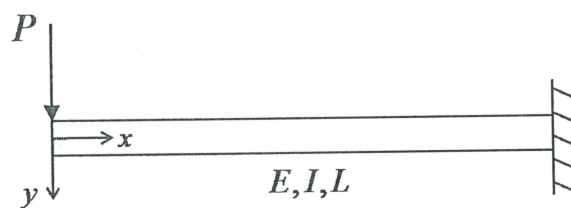
**Problem 2.** Determine the critical load  $P_{cr}$  for the structure in figure 1 using constants  $\beta, L, k_1$  and  $k_2$ . What is the length  $L$  of the beam when the critical load  $P_{cr}$  reaches its minimum value? Assume small displacements. (6p)



Kuva 1: Figure of problem 2.

**Problem 3.** The cantilever beam shown in the figure enclosed is loaded with transversal force  $P$ . Determine

- the displacement at the middle of the beam by using Castigliano's second theorem. (3p)
- the displacement of the free end of the beam by using the principle of complementary virtual work. (3p)



Kuva 2: Figure of problem 3.