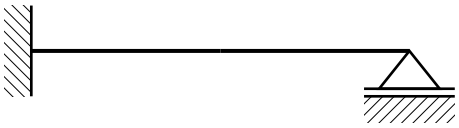
Tutorial 1

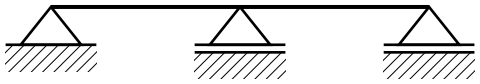
08 August 2023

1. Compute the degree of static indeterminacy (external and internal) of the systems shown below.

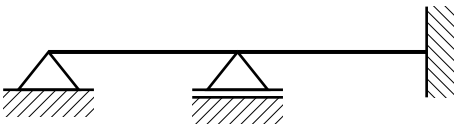
(a) $i_{\text{ext}} = 0, i_{\text{int}} = 0, KI = 3$



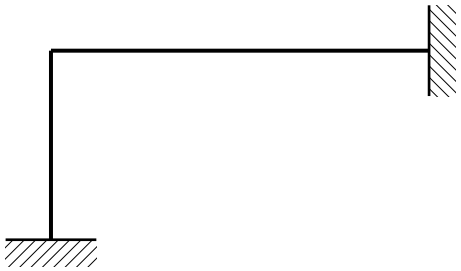
(b) $i_{\text{ext}} = 1, i_{\text{int}} = 0, KI = 2$



(c) $i_{\text{ext}} = 1, i_{\text{int}} = 0, KI = 5$

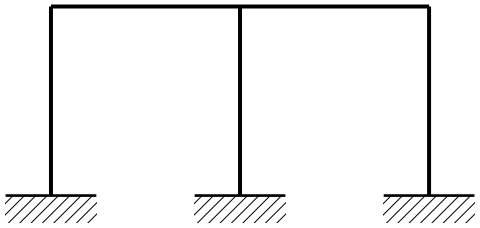


(d) $i_{\text{ext}} = 3, i_{\text{int}} = 0, KI = 3$

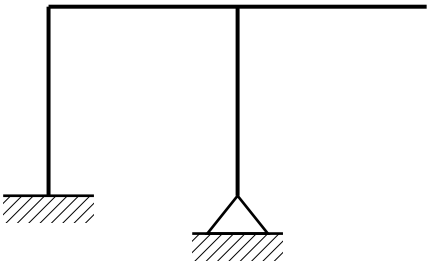


(e) $i_{\text{ext}} = 3, i_{\text{int}} = 0, KI = 3$

(f) $i_{\text{ext}} = 0, i_{\text{int}} = 0, KI = 9$

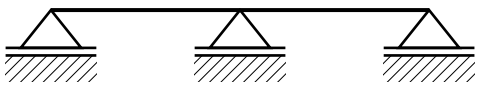


(g) $i_{\text{ext}} = 6, i_{\text{int}} = 0, KI = 9$



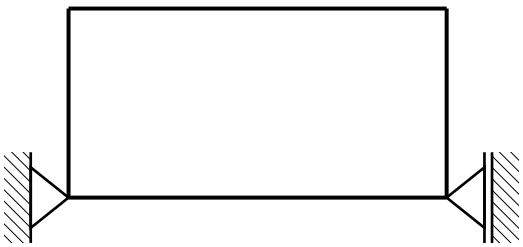
(h) $i_{\text{ext}} = 2, i_{\text{int}} = 0, KI = 10$

2. Assess the stability of the structures shown below. Provide appropriate reasons.



(a) Unstable (parallel reactions)

(b) Unstable (insufficient constraints)

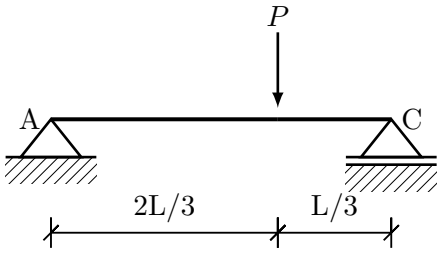


(c) Unstable (concurrent reactions)

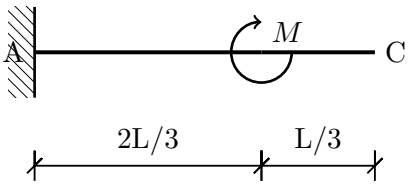
(d) Stable

3. For the structures shown in Problem 1, compute the kinematic indeterminacy (degrees-of-freedom) in each case.

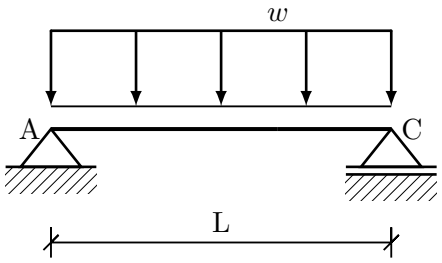
4. Compute the support reactions for the structural systems shown below (upwards, rightwards, counterclockwise positive).



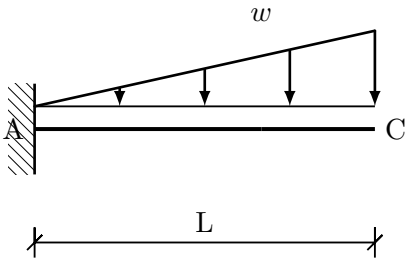
(a) $V_A = P/3, V_C = 2P/3$



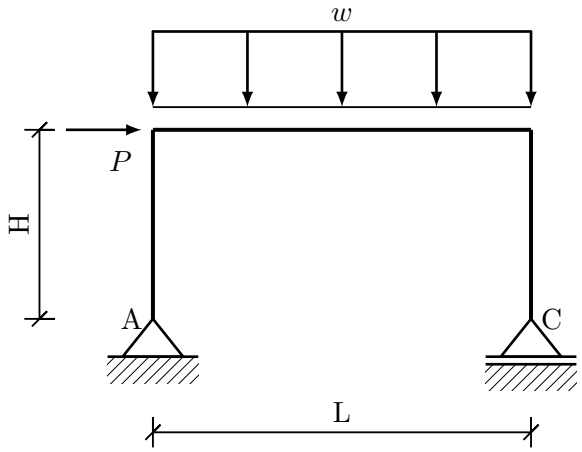
(b) $M_A = M, V_A = 0$



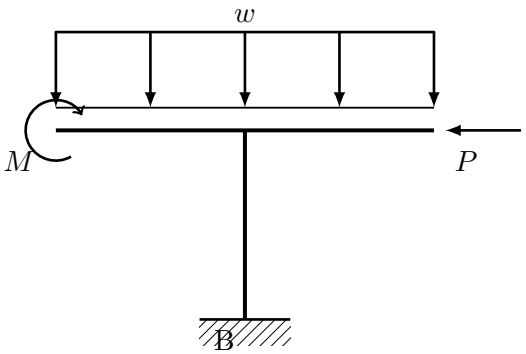
(c) $V_A = V_C = wL/2$



(d) $M_A = wL^2/3, V_A = wL/2$



(e) $V_A = wL/2 - PH/L, V_C = wL/2 + PH/L, H_A = -P$



(f) $V_B = wL, H_B = 0, M_B = M$