Key solution steps for assignment-week 6

Before you read this document, please note that:

(1) Only key steps are provided (for a better understanding of the solution method).

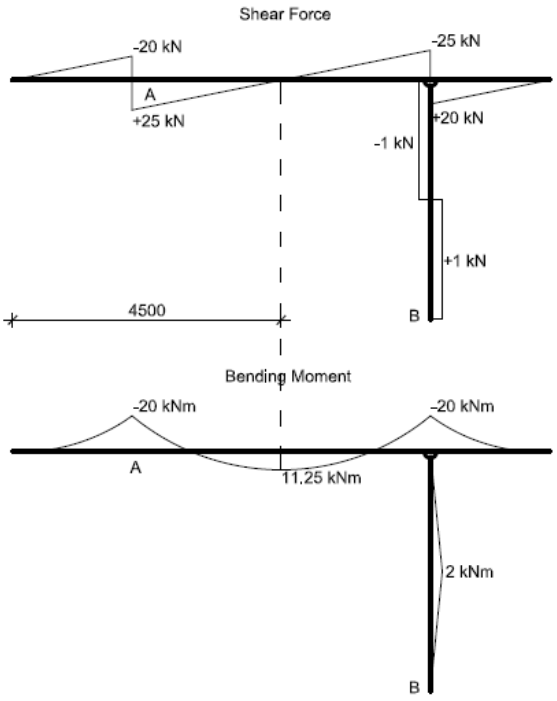
(2) For the standard solution process, please refer to examples in the lecture handout.

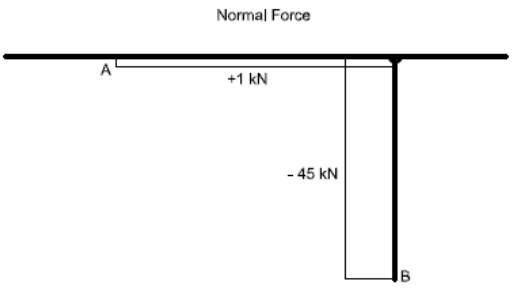
Q1:

$$P \cdot 1.5a \cdot \theta = \frac{ka\theta}{2} \cdot a \Rightarrow P_{cr} = \frac{ka}{3}$$

Q2:

(a)





(b)

$P_{cr} = -45\ KN, L = 4\ m, E = 13\ GPa$

$$I = \frac{P_{cr}L^2}{\pi^2 E} = \frac{(45 \times 10^3) \times 4}{\pi^2 (13 \times 10^9)} = 1.404 \times 10^{-6} m^4$$

$$I = \frac{a^4}{12} = 1.404 \times 10^{-6} m^4 \quad \Rightarrow a = 65\ mm$$

Check the value of the normal stress in the column:

$$\sigma = \frac{P}{A} = \frac{45}{(0.065)^2} = 10.65\ MPa < 12\ MPa \qquad \textit{OK!}$$