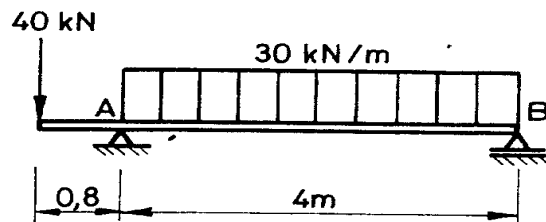


TMKS0700 STATIIKKA JA LUJUSOPPI

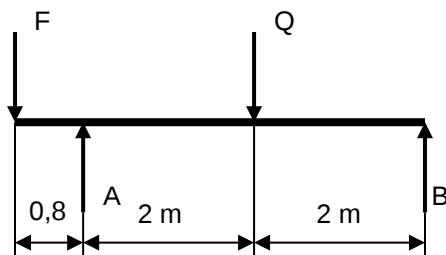
Tehtävä L3-9

Laske oheisen IPE240 tangon suurin normaalijännitys ja suurin leikkausjännitys.

Palkin omaa painoa ei oteta huomioon.



VKK



$$F = 40 \text{ kN}$$

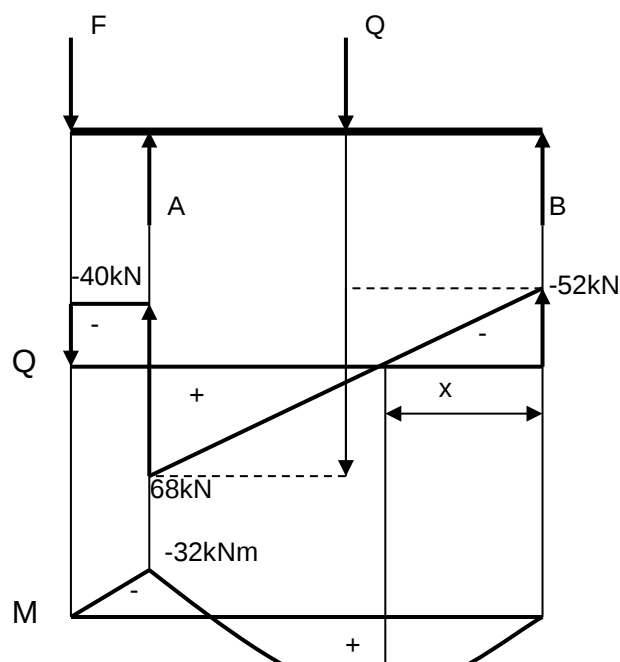
$$Q = 30 \text{ kN/m} \cdot 4 \text{ m} = 120 \text{ kN}$$

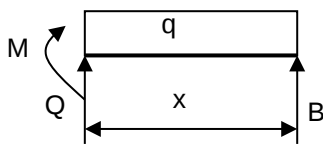
$$\uparrow \Sigma F_y = 0: \quad A - F - Q + B = 0 \quad (1)$$

$$\curvearrowright \Sigma M_A = 0: \quad F \cdot 0,8 \text{ m} - Q \cdot 2 \text{ m} + B \cdot 4 \text{ m} = 0 \quad (2)$$

$$(2) \Rightarrow B = 52 \text{ kN}$$

$$(1) \Rightarrow A = 108 \text{ kN}$$





$$q =$$

$$Q = 0$$

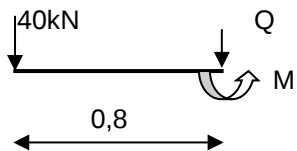
30 kN/m

$$\uparrow \Sigma F_y = 0: B - qx = 0$$

$$\Rightarrow x = 1,733 \text{ m}$$

$$M = -qx^2/2 + Bx$$

$$\Rightarrow M = 45,067 \text{ kNm}$$



$$q =$$

$$Q = 0$$

30 kN/m

$$\uparrow \Sigma F_y = 0: -40 - Q = 0$$

$$\Rightarrow Q = -40 \text{ kN}$$

$$\curvearrowleft \Sigma M = 0: M + 40 \text{ kN} \cdot 0,8 \text{ m} =$$

$$\Rightarrow M = -32 \text{ kNm}$$

Max. normaalijännitys

$$\sigma_{\max} = M_{\max}/W_z$$

$$M_{\max} = 45,067 \text{ kNm}$$

$$W_z = 324000 \text{ mm}^3$$

$$\Rightarrow \sigma_{\max} = 139,1 \text{ MPa}$$

Max. leikkausjännitys (uuman keskellä)

$$\tau_{\max} = (QS)/(I_z b)$$

$$Q = 68 \text{ kN}$$

49,763

$$S = 183000 \text{ mm}^3$$

$$I_z = 38900000 \text{ mm}^4$$

$$b = 6,2 \text{ mm}$$

$$\Rightarrow \tau_{\max} = 51,60 \text{ MPa}$$

V:

$$\sigma_{\max} =$$

139 MPa

$$\tau =$$

52 MPa