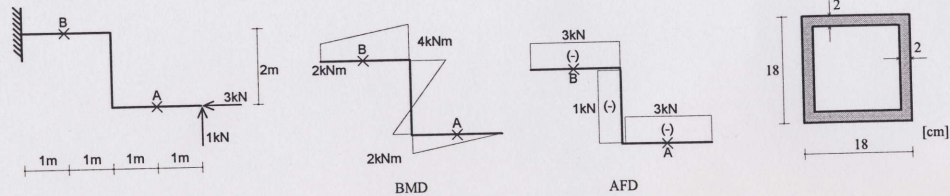


建築構造力学1B・同演習 第11回 演習問題 実施日2013/1/16	学生証 番号	氏名 <b>解答</b>	得点
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問1. (1)~(3)の間に答えなさい。ただし、単位はN,cm、有効数字3桁で答えよ。



(1) 上記の断面の断面2次モーメントIおよび断面係数Zを求めよ。

$$I = \frac{18 \times 18^3}{12} - \frac{14 \times 14^3}{12} = 5546.6 \quad \text{断面積 } A = 128 \text{ cm}^2$$

$$Z = \frac{5546.6}{9} = 616.29$$

$$I = 5550 \text{ cm}^4, \quad Z = 616 \text{ cm}^3$$

(2) 梁断面を上記とし、A点での梁上端と下端に発生する垂直応力度を求めなさい。

$$\sigma_{\text{上}} = \frac{-3000}{128} - \frac{100000}{616.29} = -185.69$$

$$\sigma_{\text{下}} = \frac{-3000}{128} + \frac{100000}{616.29} = 138.82$$

$$\text{梁上端応力度} = -186 \text{ N/cm}^2, \quad \text{梁下端応力度} = 139 \text{ N/cm}^2$$

(3) 梁断面を上記とし、B点での梁上端と下端に発生する垂直応力度を求めなさい。

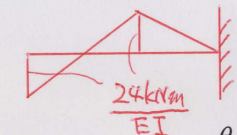
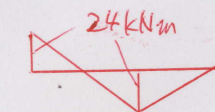
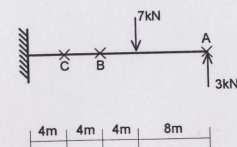
$$\sigma_{\text{上}} = \frac{-3000}{128} + \frac{300000}{616.29} = 463.34$$

$$\sigma_{\text{下}} = \frac{-3000}{128} - \frac{300000}{616.29} = -510.22$$

$$\text{梁上端応力度} = 463 \text{ N/cm}^2, \quad \text{梁下端応力度} = -510 \text{ N/cm}^2$$

問2 次のA, B, C点におけるたわみ角 $\theta_A, \theta_B, \theta_C$ およびたわみ $\delta_A, \delta_B, \delta_C$ を求めよ。ただし、部材の曲げ剛性は材軸に沿って一様でEIとする。

(1)



Handwritten calculations for Question 2 (1) using the method of superposition:

$$Q^* = \frac{64 \text{ kNm}^2}{EI}, \quad M^* = \frac{448 \text{ kNm}^3}{3EI}$$

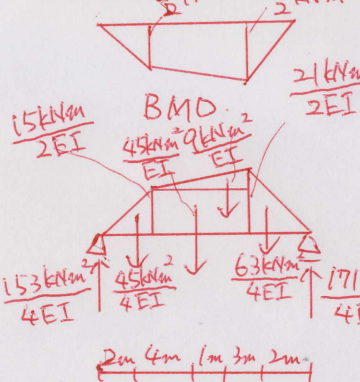
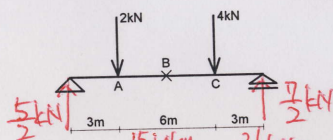
$$Q^* = \frac{72 \text{ kNm}^2}{EI}, \quad M^* = \frac{1280 \text{ kNm}^3}{3EI}$$

$$Q^* = -\frac{96 \text{ kNm}^2}{EI}, \quad M^* = \frac{64 \text{ kNm}^3}{EI}$$

$$\theta_A = \frac{-96 \text{ kNm}^2}{EI}, \quad \theta_B = \frac{64 \text{ kNm}^2}{EI}, \quad \theta_C = \frac{64 \text{ kNm}^2}{EI}$$

$$\delta_A = \frac{64 \text{ kNm}^3}{EI}, \quad \delta_B = \frac{1280 \text{ kNm}^3}{3EI}, \quad \delta_C = \frac{448 \text{ kNm}^3}{3EI}$$

(2)



Handwritten calculations for Question 2 (2) using the method of superposition:

$$Q^* = \frac{27 \text{ kNm}^2}{EI}, \quad M^* = \frac{207 \text{ kNm}^3}{2EI}$$

$$Q^* = \frac{9 \text{ kNm}^2}{4EI}, \quad M^* = \frac{297 \text{ kNm}^3}{2EI}$$

$$Q^* = -\frac{27 \text{ kNm}^2}{EI}, \quad M^* = \frac{225 \text{ kNm}^3}{2EI}$$

$$\theta_A = \frac{27 \text{ kNm}^2}{EI}, \quad \theta_B = \frac{9 \text{ kNm}^2}{4EI}, \quad \theta_C = -\frac{27 \text{ kNm}^2}{EI}$$

$$\delta_A = \frac{207 \text{ kNm}^3}{2EI}, \quad \delta_B = \frac{297 \text{ kNm}^3}{2EI}, \quad \delta_C = \frac{225 \text{ kNm}^3}{2EI}$$