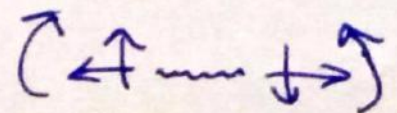
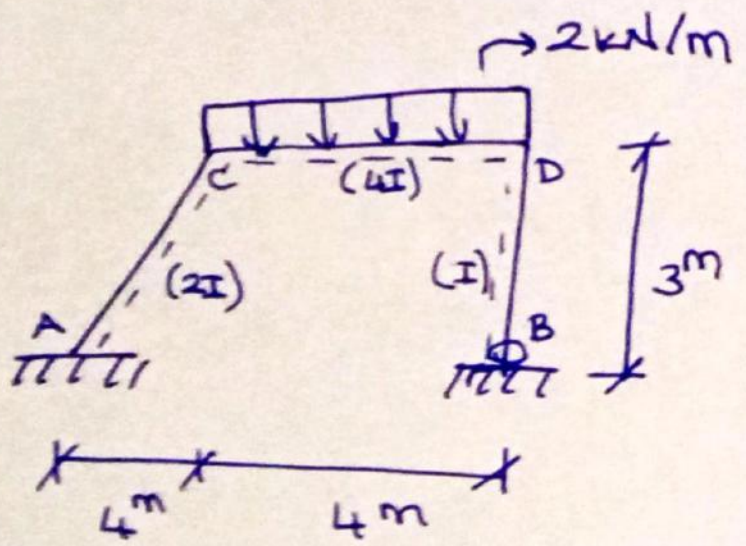


KUVVET YÖNTEMİ

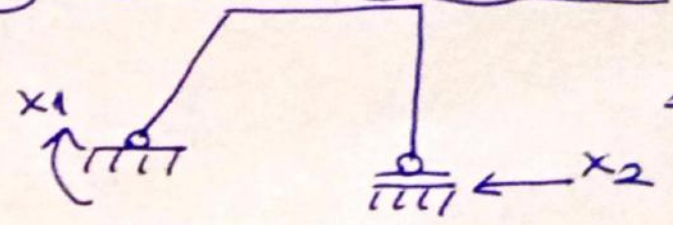


Yön okları



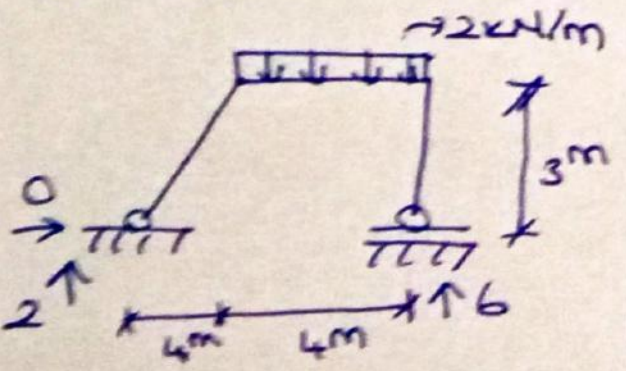
$\#EI = 6400 \text{ kNm}^2, EA = GA' = \infty$

① Esas sistemi belirle.



⇒ İzostatik Esas sistem ve Hiperstatik Bilinmeyenler

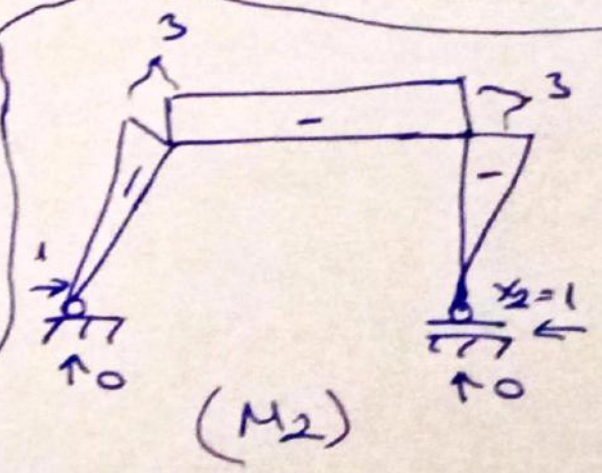
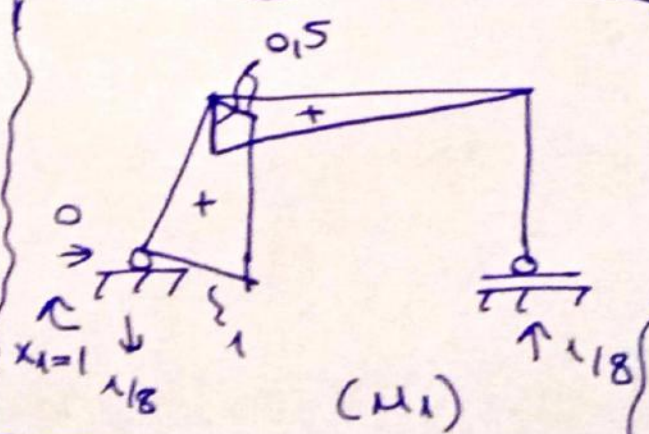
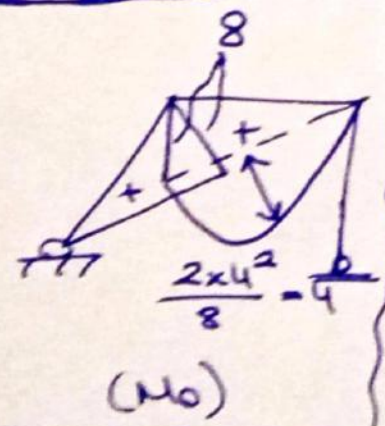
② Mesnet Tepkileri



$$R_{AY} = \frac{2 \times 4 \times 2}{8} = 2 \text{ kN}$$

$$R_{BY} = (2 \times 4) - 2 = 6 \text{ kN}$$

③ Moment Grafikleri



* Süreklilik denklemlerine geçilir.

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④ Sürekli Denklemi

$$\delta_{10} + \delta_{11} \cdot X_1 + \delta_{12} \cdot X_2 = 0$$

$$\delta_{20} + \delta_{21} \cdot X_1 + \delta_{22} \cdot X_2 = 0$$

$$\begin{aligned} 8,67/EI + (1,54/EI)X_1 - (3,25/EI) \cdot X_2 &= 0 \\ \Rightarrow -40/EI - (3,25/EI)X_1 + (25,5/EI) \cdot X_2 &= 0 \\ \hookrightarrow X_1 = -3,17 \text{ kNm}, X_2 = 1,16 \text{ kN} \end{aligned}$$

$$\delta_{10} = \int M_1 M_0 \frac{dx}{EI} = \frac{1}{6} \cdot 5 \cdot 8 (1 + 2 \cdot 0,5) \frac{1}{2EI} + \left[\frac{1}{3} \cdot 4 \cdot 8 \cdot 0,5 + \frac{1}{3} \cdot 4 \cdot 4 \cdot 0,5 \right] \cdot \frac{1}{4EI} = \frac{8,67}{EI}$$

$$\delta_{20} = \int M_2 M_0 \frac{dx}{EI} = -\frac{1}{3} \cdot 5 \cdot 8 \cdot 3 \cdot \frac{1}{2EI} - \left[\frac{1}{2} \cdot 4 \cdot 8 \cdot 3 + \frac{2}{3} \cdot 4 \cdot 4 \cdot 3 \right] \cdot \frac{1}{4EI} = -40/EI$$

$$\delta_{11} = \frac{1}{6} \cdot 5 (2 \cdot 1 \cdot 1 + 2 \cdot 1 \cdot 0,5 + 2 \cdot 0,5 \cdot 0,5) \frac{1}{2EI} + \frac{1}{3} \cdot 4 \cdot 0,5 \cdot 0,5 \cdot \frac{1}{4EI} = 1,54/EI$$

$$\delta_{12} = \delta_{21} = -\frac{1}{6} \cdot 5 \cdot 3 (1 + 2 \cdot 0,5) \cdot \frac{1}{2EI} - \frac{1}{2} \cdot 4 \cdot 0,5 \cdot 3 \cdot \frac{1}{4EI} = -3,25/EI$$

$$\delta_{22} = \frac{1}{3} \cdot 5 \cdot 3 \cdot 3 \cdot \frac{1}{2EI} + 4 \cdot 3 \cdot 3 \cdot \frac{1}{4EI} + \frac{1}{3} \cdot 3 \cdot 3 \cdot 3 \cdot \frac{1}{EI} = 25,5/EI$$

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Arslan

Çizelge 1.2.1 $\dot{I}\dot{C} = \int j(x)k(x)dx$ İntegral Çarpım Değerleri

1		JkL	$jkL/2$	$jkL/2$	$j(k_1 + k_2)L/2$	$2jkL/3$	$2jkL/3$	$jkL/3$
2		$jkL/2$	$jkL/3$	$jkL(1+\delta)/6$	$j(2k_1 + k_2)L/6$	$jkL/3$	$5jkL/12$	$jkL/4$
3		$jkL/2$	$jkL/6$	$jkL(1+\gamma)/6$	$j(k_1 + 2k_2)L/6$	$jkL/3$	$jkL/4$	$jkL/12$
4		$\frac{1}{2} jkL$	$\frac{1}{6} jkL(1+\beta)$	$\frac{jkL}{6\alpha\delta} [2\alpha - \alpha^2 - \gamma^2]$ $a \geq c$; $a=c$ ise $jkL/3$	$\frac{jL}{6} [k_1(1+\beta) + k_2(1+\alpha)]$	$\frac{jkL}{3} (1+\alpha\beta)$	$\frac{jkL}{12} (5-\alpha-\alpha^2)$	$\frac{jkL}{12} (1+\beta+\beta^2)$
5		$\frac{kL}{2} (j_1 + j_2)$	$\frac{kL}{6} (2j_1 + j_2)$	$\frac{kL}{6} [j_1(1+\delta) + j_2(1+\gamma)]$	$\frac{L}{6} [j_1(2k_1 + k_2) + j_2(k_1 + 2k_2)]$	$\frac{kL}{3} (j_1 + j_2)$	$\frac{kL}{12} (5j_1 + 3j_2)$	$\frac{kL}{12} (3j_1 + j_2)$
6		$2jkL/3$	$jkL/3$	$(1+\gamma\delta)jkL/3$	$j(k_1 + k_2)L/3$	$8jkL/15$	$7jkL/15$	$jkL/5$
7		$2jkL/3$	$5jkL/12$	$(5-\gamma-\gamma^2)jkL/12$	$j(5k_1 + 3k_2)L/12$	$7jkL/15$	$8jkL/15$	$3jkL/10$
8		$2jkL/3$	$jkL/4$	$(5-\delta-\delta^2)jkL/12$	$j(3k_1 + 5k_2)L/12$	$7jkL/15$	$11jkL/30$	$2jkL/15$
9		$jkL/3$	$jkL/4$	$(1+\delta+\delta^2)jkL/12$	$j(3k_1 + k_2)L/12$	$jkL/5$	$3jkL/10$	$jkL/5$
10		$jkL/3$	$jkL/12$	$(1+\gamma+\gamma^2)jkL/12$	$j(k_1 + 3k_2)L/12$	$jkL/5$	$2jkL/15$	$jkL/30$

5) Süperpozisyon Denklemi

$$R_{AV} = R_{AV0} + R_{AV1} \cdot X_1 + R_{AV2} \cdot X_2$$
$$= 2 - \frac{1}{8} (-3,17) + 0 = 2,4 \text{ kN}$$

$$R_{BV} = 6 + \frac{1}{8} (-3,17) + 0 = 5,6 \text{ kN}$$

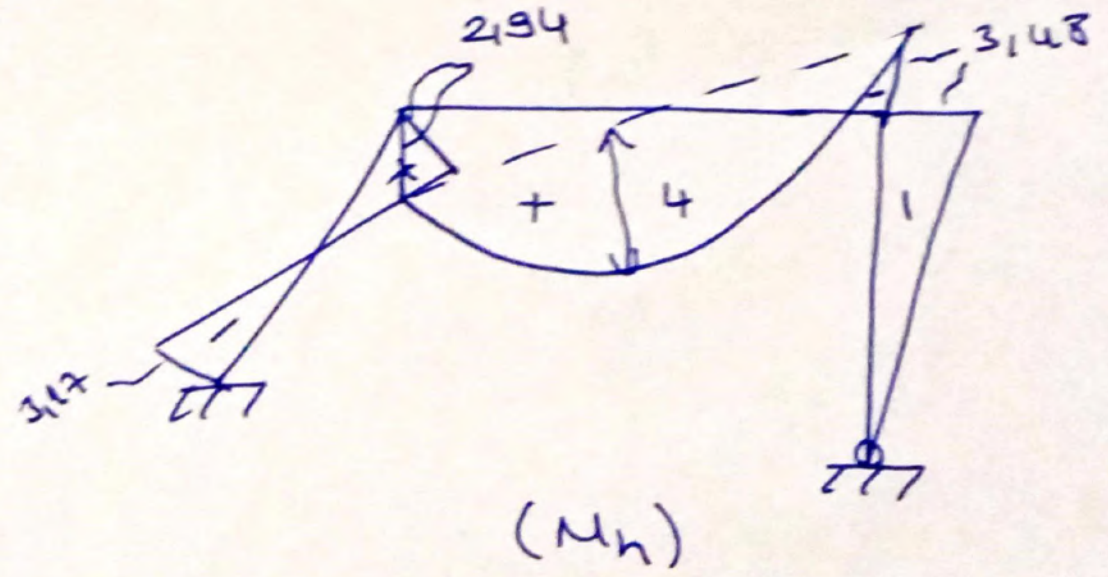
$$R_{BH} = X_2 = 1,16 \text{ kN}$$

$$M_A = X_1 = -3,17 \text{ kNm}$$

$$M_C = 8 + 0,5 (-3,17) - 3(1,16)$$
$$= 2,94 \text{ kNm}$$

$$M_D = 0 + 0 - 3(1,16) = -3,48 \text{ kNm}$$

6) Moment Diyagramı



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