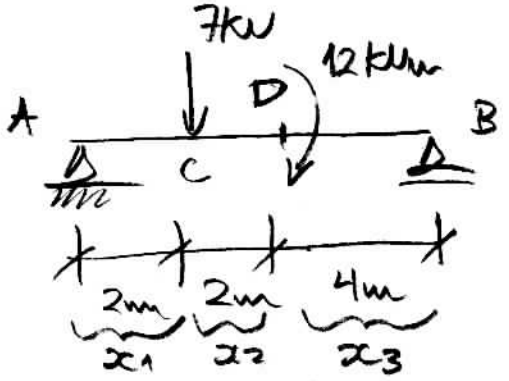
TE1-3.5



$\curvearrowleft \Sigma M_B = 0 \quad V_A \times 8 - 7 \times 6 + 12 = 0$

$V_A = \frac{1}{8}(42 - 12) = 3{,}75\ kN$

$\uparrow \Sigma F_V = 0 \quad 3{,}75 - 7 + V_B = 0$

$V_B = 7 - 3{,}75 = 3{,}25\ kN$

$M_{AC}(x_1) = V_A \times x = 3{,}75\,x_1$

$Q_{AC}(x_1) = 3{,}75$

$x_1 \rightarrow [0;2]$ $\{0;2\}$

$M_C^{ESQ} = M_{AC}(x_1 = 2) = 3{,}75 \times 2 = 7{,}5\ kNm$

$Q_C^{ESQ} = 3{,}75\ kN$

$M_{CD}(x_2) = 7{,}5 + 3{,}75\,x_2 - 7x_2 = 7{,}5 - 3{,}25x_2$

$Q_{CD}(x_2) = -3{,}25$

$x_2 \rightarrow$ $[0;2]$ $\{2;4\}$

$M_D^{ESQ} = M_{CD}(x_2 = 2) = 7{,}5 - 3{,}25 \times 2 = 1\ kNm$

$Q_D^{ESQ} = -3{,}25\ kN$

$M_{DB}(x_3) = 1 + 12 - 3{,}25\,x_3 = 13 - 3{,}25\,x_3$

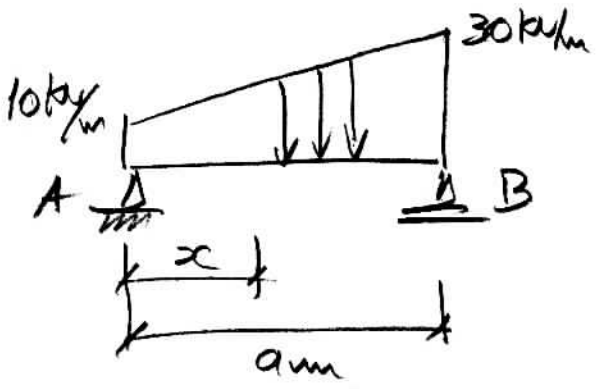
$Q_{DB}(x_3) = -3{,}25$

$x_3 \rightarrow$ $[0;4]$ $\{4;8\}$

$M_B = M_{DB}(x_3 = 4) = 13 - 3{,}25 \times 4 = 0$ OK

$Q_B = -3{,}25\ kN$ OK

TE Ex-3.4



$$q(x) = \frac{(30-10)}{9} \cdot x + 10$$

$$q(x) = \frac{20}{9} x + 10$$

$$R = \int_0^9 \frac{20}{9} x + 10 \, dx$$

$$R = \left[\frac{20}{9} \frac{x^2}{2} + 10x \right]_0^9 = 180 \text{ kN}$$

$$M_R = \int_0^9 q(x) \cdot x \, dx = \int_0^9 \frac{20}{9} x^2 + 10x \, dx$$

$$M_R = \left[\frac{20}{9} \frac{x^3}{3} + 10 \frac{x^2}{2} \right]_0^9 = 945 \text{ kNm}$$

$$\bar{x} = M_R / R = 945 \text{ kNm} / 180 \text{ kN} = 5{,}25 \text{ m}$$

$\circlearrowleft^{+}$ $\Sigma M_B = 0 \quad V_A \times 9 - 180(9 - 5{,}25) = 0 \quad V_A = 75 \text{ kN}$

$\uparrow^{+}$ $\Sigma V = 0 \quad 75 - 180 + V_B = 0 \quad V_B = 105 \text{ kN}$

$$Q(x) = -\int q(x) \, dx = -\frac{20}{9} \frac{x^2}{2} - 10x + C_1$$

Como $Q(x=0) = 75 \text{ kN} \quad C_1 = 75$

$$Q(x) = -\frac{10}{9} x^2 - 10x + 75$$

$$M(x) = \int Q(x) \, dx = -\frac{10}{9} \frac{x^3}{3} - 10 \frac{x^2}{2} + 75x + C_2$$

Como $M(x=0) = 0 \quad C_2 = 0$

$$M(x) = -\frac{10}{27} x^3 - 5x^2 + 75x$$