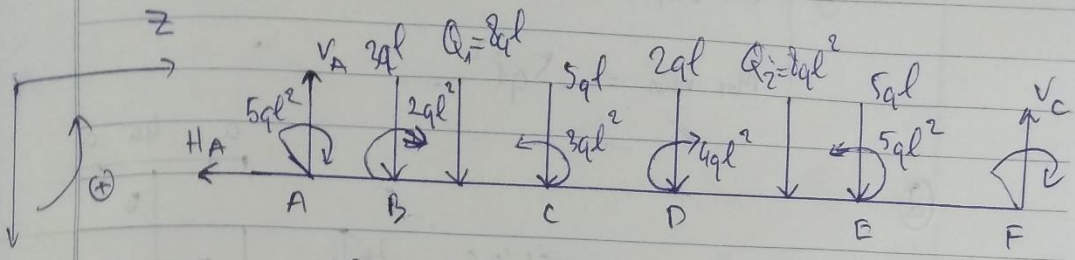
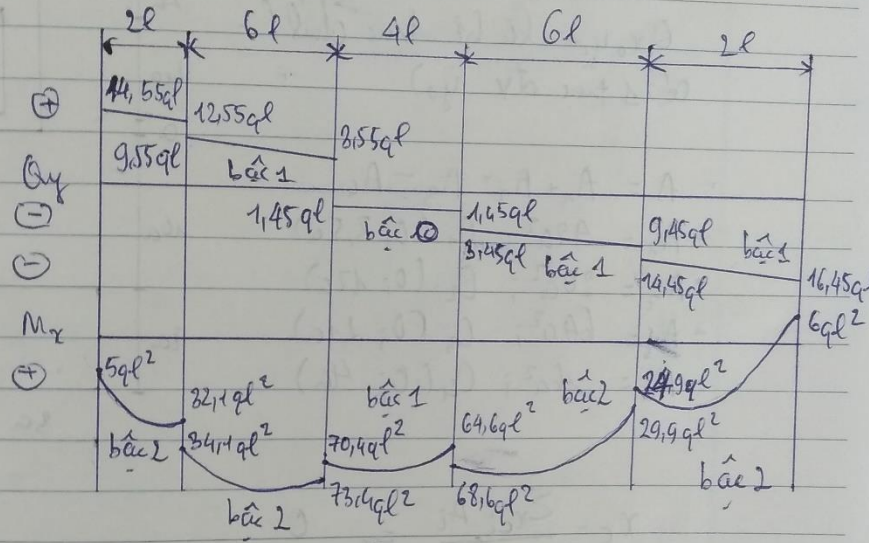
Họ và tên: Nguyễn Công Minh Nhóm : 19.67 Lớp: 19X1CLC3	

BÀI TẬP CHƯƠNG 7

- Giải phóng liên kết.





- Áp dụng phương trình cân bằng

$\Sigma z = 0 \Leftrightarrow H_A = 0$

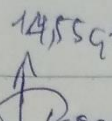
$\Sigma y = 0 \Leftrightarrow V_A + V_C = 31ql$

$\Sigma M_{Ax} = 0 \Leftrightarrow 20l \cdot V_C = 329ql^2$

$\Rightarrow V_C = 16,45ql$ (↑)

$\Rightarrow V_A = 14,55ql$ (↑)

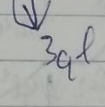
HẢI TIẾN

* Xét tại A : 

$$\begin{cases} Q_y(A^-) = 0 \\ M_x(A^-) = 0 \end{cases} \Rightarrow \begin{cases} Q_y(A^+) = Q_y(A^-) \pm |P| \\ \quad = 14,55ql \\ M_x(A^+) = M_x(A^-) \pm |M_x| \\ \quad = 5ql^2 \end{cases}$$

* Đoạn A^+B^-

$$Q_y(B^-) = Q_y(A^+) \pm S_q^{AB}$$
$$= 14,55ql - 2ql = 12,55ql$$
$$M_x(B^-) = M_x(A^+) \pm S_{Q_y}^{AB}$$
$$= 5ql^2 + 27,1ql^2 = 32,1ql^2$$

* Xét tại B : 

$$Q_y(B^+) = Q_y(B^-) \pm |P|$$
$$= 9,55ql$$
$$M_x(B^+) = M_x(B^-) \pm |M_x|$$
$$= 34,1ql^2$$

* Xét đoạn B^+C^-

$$Q_y(C^-) = Q_y(B^+) \pm S_q^{BC}$$
$$= 9,55ql - 6ql = 3,55ql$$
$$M_x(C^-) = M_x(B^+) \pm S_{Q_y}^{BC}$$
$$= 34,1ql^2 + 39,3ql^2$$
$$= 73,4ql^2$$

HẢI TIẾN

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* Xét tại C:

$9ql^2$ ↓ $5ql$

$Q_y(C^+) = Q_y(C^-) \pm |P| = -1,45\ ql$

$M_x(C^+) = M_x(C^-) \pm |M_x| = 70,4\ ql^2$

* Xét đoạn C^+D^-:

$Q_y(D^-) = Q_y(C^+) \pm S_q^{CD} = -1,45\ ql$

$M_x(D^-) = M_x(C^+) \pm S_{Q_y}^{CD}$

$= 70,4ql^2 \pm 5,8\ ql^2 = 64,6\ ql^2$

* Xét tại D: $2ql$ ↓ $4ql^2$

$Q_y(D^+) = Q_y(D^-) \pm |P| = -3,45\ ql$

$M_x(D^+) = M_x(D^-) \pm |M_x| = 68,6\ ql^2$

* Xét đoạn D^+E^-

$$Q_y(E^-) = Q_y(D^+) \pm S_q^{DE}$$
$$= -3,45ql - 6ql = -9,45ql$$
$$M_x(E^-) = M_x(E^+) \pm S_{Q_y}^{DE}$$
$$= 68,6 - 38,7 = 29,9ql^2$$

Xét tại E^-: $5ql^2 \leftarrow \downarrow 5ql$

$$Q_y(E^+) = Q_y(E^-) \pm |P|$$
$$= -14,45ql$$
$$M_x(E^+) = M_x(E^-) \pm |M_{xl}|$$
$$= 29,9ql^2 - 5ql^2$$
$$= 24,9ql^2$$

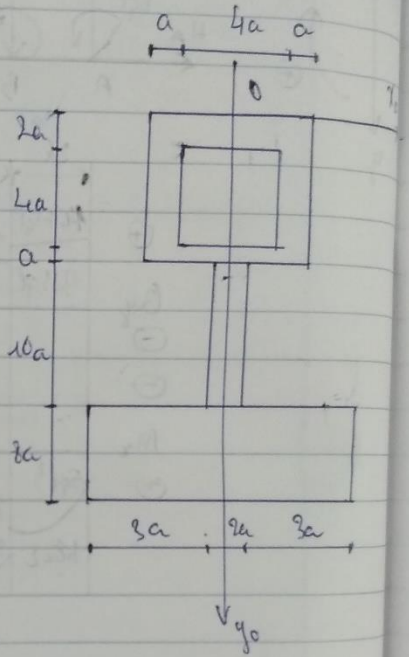
* Xét đoạn E^+F^-

$$Q_y(F^-) = Q_y(E^+) \pm S_q^{EF}$$
$$= -14,45ql - 2ql = -16,45ql$$

$$M_x(F^-) = M_x(E^+) \pm S_{Q_y}^{EF}$$
$$= -6ql^2$$

$$\Rightarrow \begin{cases} M_{x\,max} = 73{,}4\,ql^2 \\ M_{x\,min} = 5ql^2 \end{cases}$$

(2)



$0x_0y_0$ là hệ trục chính (có 1 trục đx y_0)

- $A = A_1 + A_2 + A_3 - A_4$
- $A_1 = 42a^2$; $C_1(0; 3{,}5a)$
- $A_2 = 20a^2$; $C_2(0; 12a)$
- $A_3 = 64a^2$; $C_3(0; 21a)$
- $A_4 = 16a^2$; $C_4(0; 4a)$

$$x_C = \frac{\sum x_{ci} \cdot A_i}{\sum A_i} = 0$$

$$y_C = \frac{\sum y_{ci} \cdot A_i}{\sum A_i} = \frac{1667}{110}\,a$$

- Momen quán chính trung tâm.

$$J_x = J_{x_0}^{(1)} + J_x^{(2)} + J_x^{(3)} - J_x^{(4)}$$
$$= 6758{,}03\,a^4$$

$$\Rightarrow J_x^{(1)} = J_{x_1}^{(1)} + (y_C - y_{C_1})^2 A_1$$
$$= 5876{,}29\,a^4$$

(3)

HẢI TIẾN

HẢI TIẾN

+ $J_x^{(2)} = J_{x_2}^{(2)} + (y_c - y_{c_2})^2 A_2^*$

$= 365,69\ a^4$

+ $J_x^{(3)} = J_{x_3}^{(3)} + (y_c - y_{c_3})^2 . A_3$

$= 2528,17\ a^4$

+ $J_x^{(4)} = J_{x_4}^{(4)} + (y_c - y_{c_4})^2 . A_4$

$= 2012,12\ a^4$

* $J_y = J_y^{(1)} + J_y^{(2)} + J_y^{(3)} - J_y^{(4)} = \frac{1358}{3} a^4$

$=$

+) $J_y^{(1)} = \frac{h.b^3}{12} = 126\ a^4$

+ $J_y^{(2)} = \frac{hb^3}{12} = \frac{20}{3} a^4$

+ $J_y^{(3)} = \frac{h.b^3}{12} = \frac{1024}{3} a^4$

+ $J_y^{(4)} = \frac{h.b^3}{12} = \frac{64}{3} a^4$

(3)

a) +) K B của phần tử dầm.

* Vật liệu dẻo.

$\max(\sigma_{z\max}, |\sigma_{z\min}|) \leq [\sigma]$

* $\text{Max}\,|M_x| = 73{,}4\,ql^2$ → kéo dưới.

$\Rightarrow |y^k_{max}| = \frac{1667}{110}a > |y^n_{max}| = \frac{1083}{110}a$

$\Rightarrow \sigma = \frac{\text{Max}\,|M_x|}{J_x} \cdot \frac{1667}{110}a \le [\sigma]$.

$= \frac{73{,}4ql^2}{6758{,}03a^4} \cdot \frac{1667}{110}a \le [\sigma]$

$\Rightarrow a \ge [a] = \sqrt[3]{\frac{73{,}4ql^2 \cdot 1667}{6758{,}03 \cdot 110 \cdot [\sigma]}}$

$\Rightarrow a \ge 2{,}65\ (cm)$

b. ĐKB của vật liệu giòn.

$\sigma^{(1)}_{z\,max} \le [\sigma]_k = 2\ (kN/cm^2)$

$|\sigma^{(4)}_{z\,min}| \le [\sigma]_n = 14\ (kN/cm^2)$

$\sigma^{(2)}_{z\,max} \le [\sigma]_k = 2\ (kN/cm^2)$

$|\sigma^{(3)}_{z\,min}| \le [\sigma]_n = 14\ (kN/cm^2)$

HẢI TIẾN

$$\Rightarrow \begin{cases} \sigma^{①}_{z\max} = \dfrac{|M_{x\min}|}{J_x} \cdot \dfrac{1083}{110} \cdot a \le 2. \\ |\sigma^{①}_{z\min}| = \dfrac{|M_{x\min}|}{J_x} \cdot \dfrac{1667}{110} a \le 14 \\ \sigma^{②}_{z\max} = \dfrac{|M_{x\max}|}{J_x} \cdot \dfrac{1667}{110} a \le 2. \\ |\sigma^{①}_{z\min}| = \dfrac{|M_{x\min}|}{J_x} \cdot \dfrac{1083}{110} \cdot a \le 14 \end{cases}$$

$$\Rightarrow \begin{cases} a^{①} \ge 1,58 (cm) \\ a^{②} \ge 0,95 (cm) \\ a^{②} \ge 5,29 (cm) \\ a^{②} \ge 2,4 (cm) \end{cases}$$

Vậy $a \ge 5,29$ cm thoả mãn ĐKB.

④

$$M_{ax} |\sigma_{zy}| = \frac{Max|a_y| \cdot |S_x^c|}{J_x \cdot b^c}$$

* $b^c = 2a$

$$|S_x^c| = S_x^2 + S_x^3 = \frac{13007}{55} a^3$$

$$\Rightarrow S_x^2 = \frac{1}{2}\left(\frac{1667}{110}a - 8a\right)\cdot(2a \cdot 10a)$$

$$= \frac{787}{11} a^3$$

$$\Rightarrow S_x^3 = \frac{1}{2}\left(\frac{1667}{110}a - 10a\right)\cdot(8a \cdot 8a)$$

$$= \frac{9072}{55} a^3$$

$$\Rightarrow \text{Max}\,|\sigma_{zy}| = \frac{16,45al \cdot \frac{13007}{55} a^3}{6758,03a^4 \cdot 2a}$$

* Với VL dẻo

$$\text{Max}\,|\sigma_{zy}| = 0,25 (KN/cm^2)$$

* Với VL giòn

$$\text{Max}\,|\sigma_{zy}| = 0,062 (KN/cm^2)$$

HẢI TIẾN

HẢI TIẾN