

**פתרון המבחן בחישוב סטטי וחוזק חומרים**

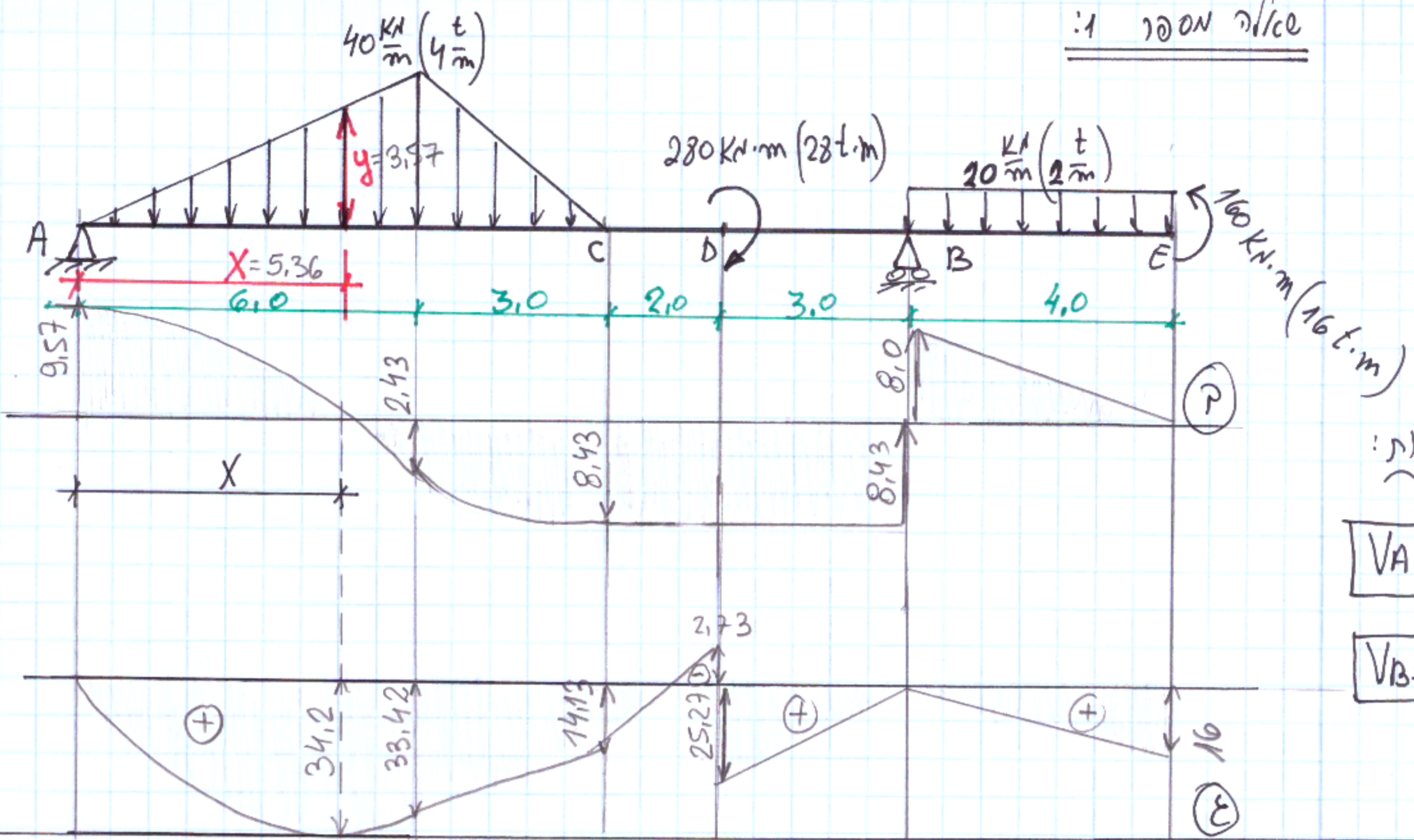
שאלון מספר 90322

קיץ 2023

מועד א'

פתרון: חנה גוטהולץ

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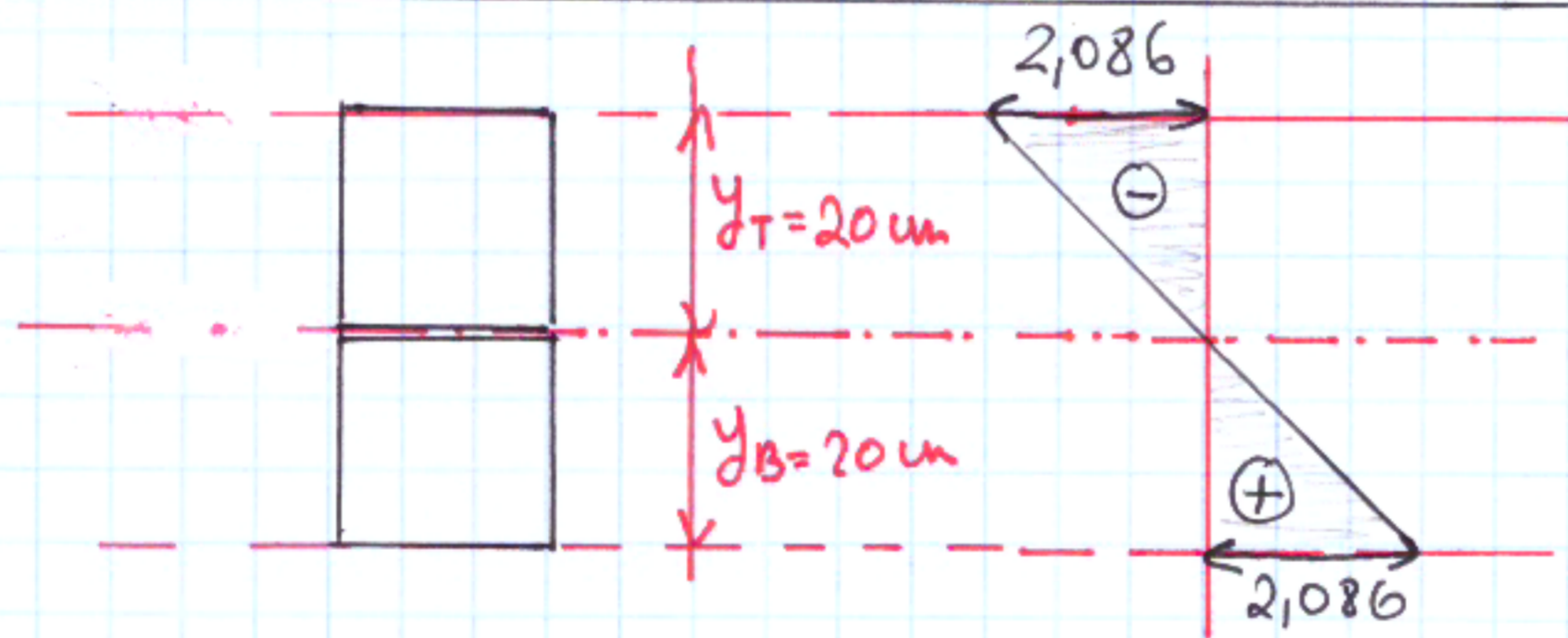
תגובות:  
 $V_A = 9.57 t$   
 $V_B = 16.43 t$

$$\frac{4}{6} = \frac{y}{X} \Rightarrow 4X = 6y \Rightarrow X = 1.5y \quad // \quad 9.57 - 0.5Xy = 0 = 9.57 - 0.75y^2 = 0 \Rightarrow y = 3.57 t \quad X = 5.36 m$$

$$M_{max} = 9.57 \cdot 5.36 - 3.57 \cdot \frac{5.36}{2} \cdot \frac{5.36}{3} = \underline{\underline{34.2}} \text{ t}\cdot\text{m}$$

RHS 200/200 (t=16)     $A = 117 \text{ cm}^2$      $I_x = 6,524 \text{ cm}^4$     (3)

$$\sum I_x = (6,524 + 117 \cdot 10^2) \cdot 2 = \underline{\underline{36,448}} \text{ cm}^4 \quad \Rightarrow \quad W_x = \frac{36,448}{20} = \underline{\underline{1,822}} \text{ cm}^3$$

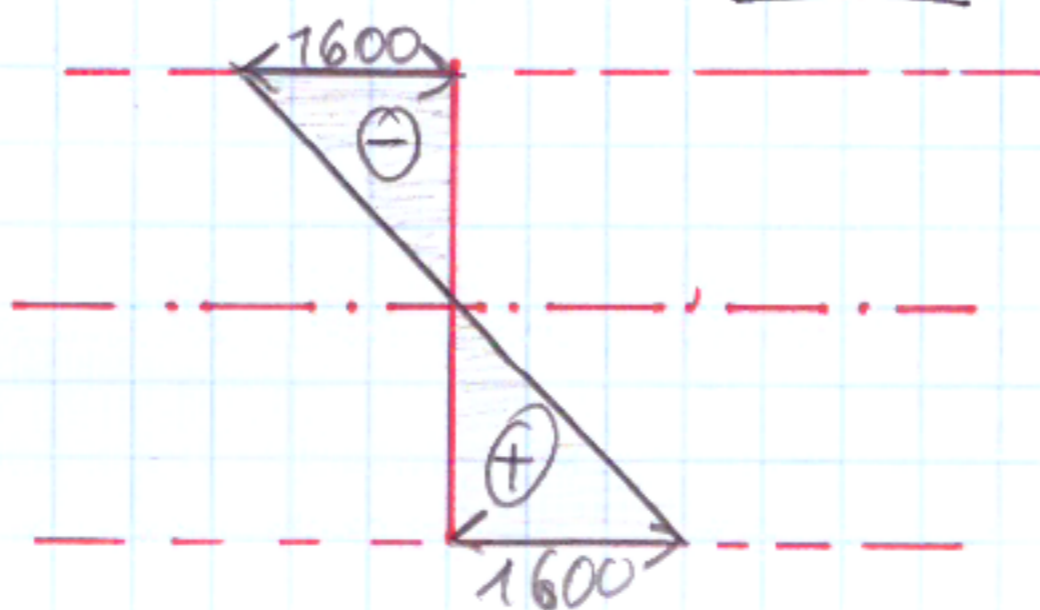


עקרו הבולט (היתוף):  
 $M = 38 \text{ t}\cdot\text{m}$     (2)

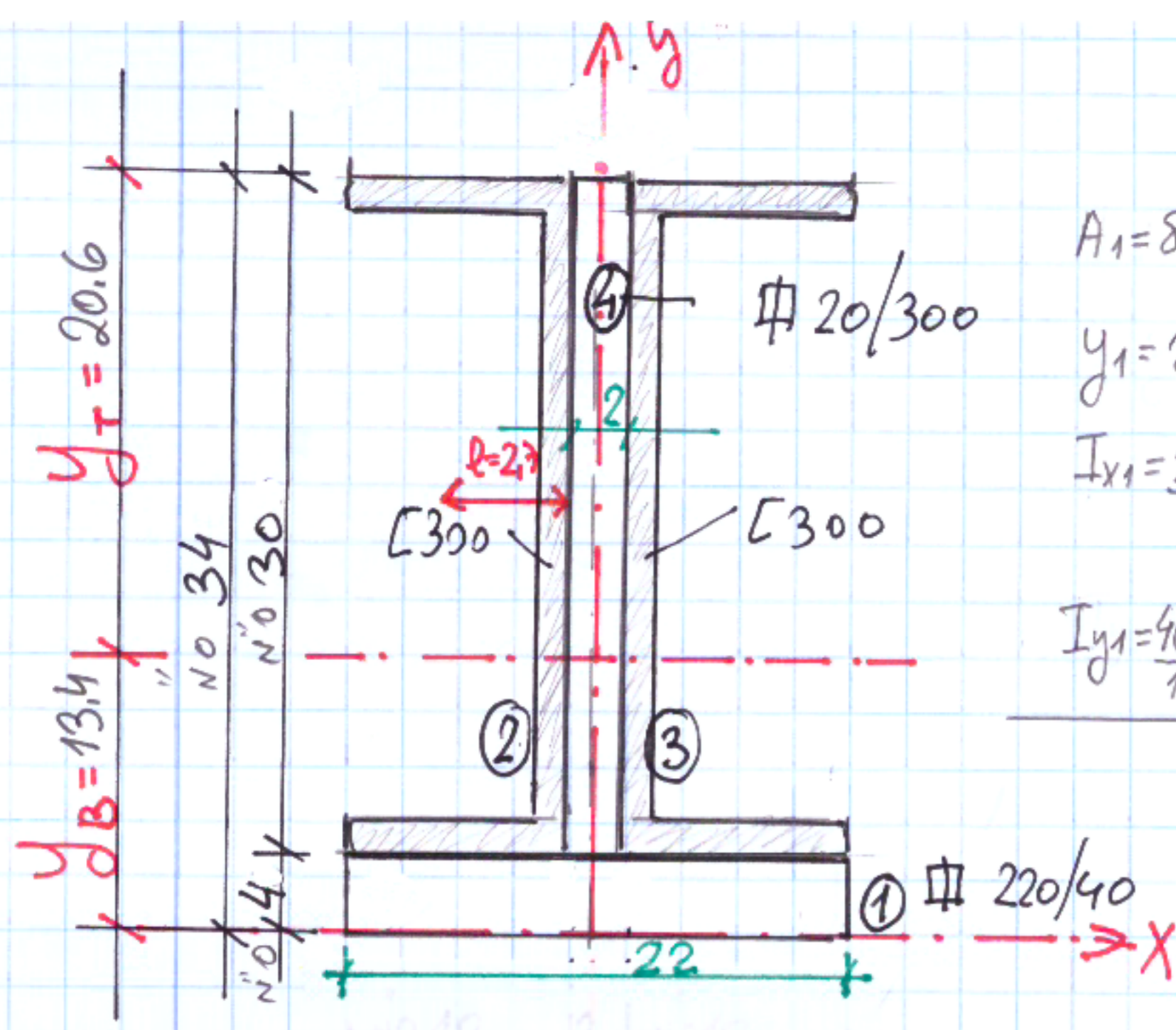
$$\sigma = \frac{38 \cdot 10^5}{1,822} = \underline{\underline{2,086}} \frac{\text{kg}}{\text{cm}^2}$$

עקרו הבולט (היתוף):  
 $M = 38 \text{ t}\cdot\text{m}$     (1)

$$\sigma = \frac{M}{W_x} = 1600 \Rightarrow W_x = \frac{38 \cdot 10^5}{1600} = \underline{\underline{2,375}} \text{ cm}^3$$



2. תכנון פרופיל



$A_1 = 88 \text{ cm}^2$	$A_2 = A_3 = 58.8 \text{ cm}^2$	$A_4 = 60 \text{ cm}^2$
$y_1 = 2 \text{ cm}$	$y_2 = y_3 = 19 \text{ cm}$	$y_4 = 19 \text{ cm}$
$I_{x1} = \frac{22 \cdot 4^3}{12} = 117$	$I_{x2} = I_{x3} = 8030$	$I_{x4} = \frac{2 \cdot 30^3}{12} = 4,500 \text{ cm}^4$
$I_{y1} = \frac{40 \cdot 2^3}{12} = 3,550$	$I_{y2} = I_{y3} = 495$	$I_{y4} = \frac{30 \cdot 2^3}{12} = 20 \text{ cm}^4$

$$y_B = \frac{88 \cdot 2 + (58.8 \cdot 19 \cdot 2) + 60 \cdot 19}{88 + (58.8 \cdot 2) + 60} = \frac{3550.4}{265.6} = 13.4$$

$$I_{x1} = 117 + 88(13.4 - 2)^2 = 11,554 \text{ cm}^4$$

$$I_{x2} = 8030 + 58.8(13.4 - 19)^2 = 9,874$$

$$I_{x3} = 9,874$$

$$I_{x4} = 4500 + 60(13.4 - 19)^2 = 6,382$$

$$I_{xx} = 37,684 \text{ cm}^4$$

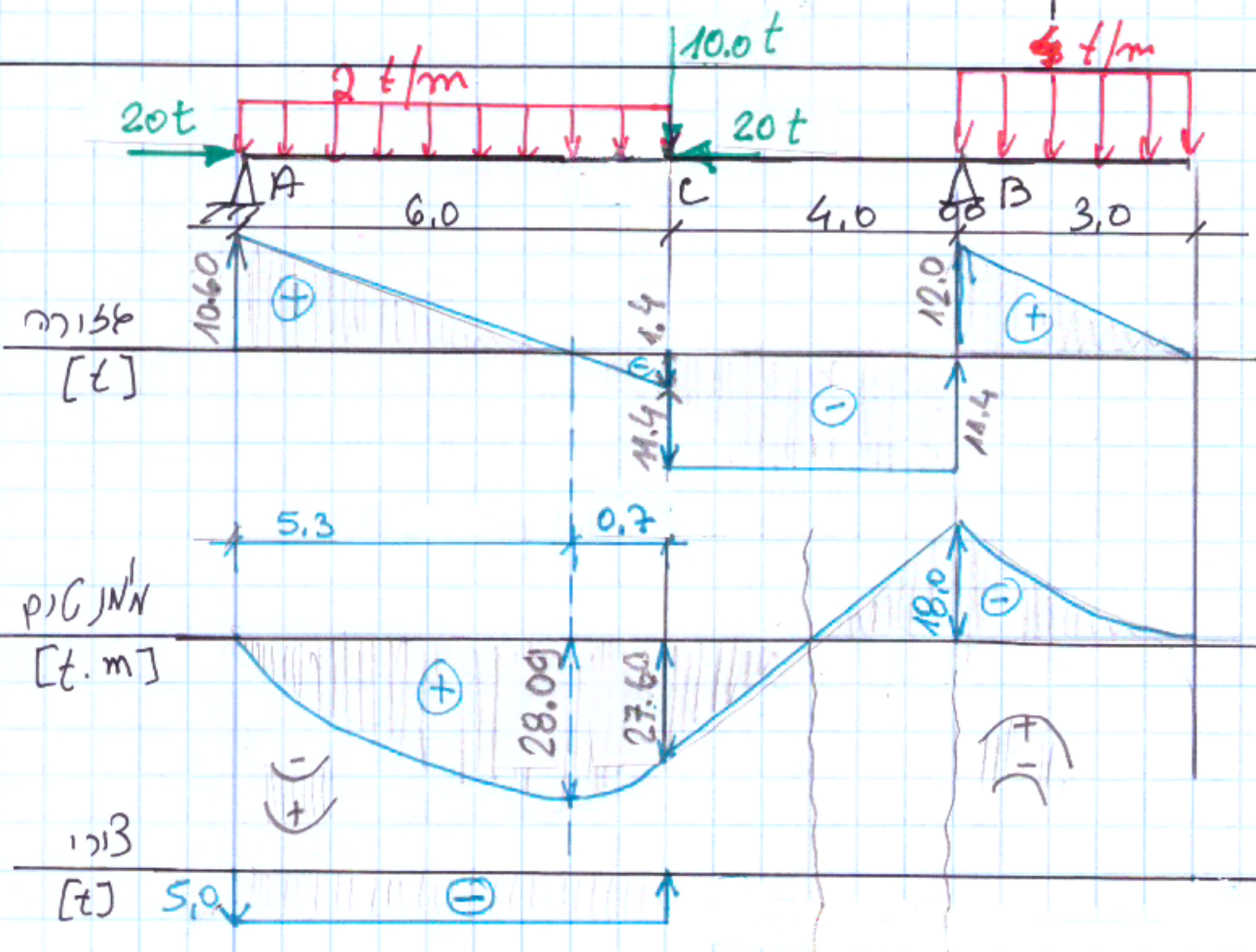
$$I_{y1} = 3,550 + 00k = 3,550 \text{ cm}^4$$

$$I_{y2} = 495 + 58.8(2.7 + 1)^2 = 1,300$$

$$I_{y3} = 1,300$$

$$I_{y4} = 20 + 00k = 20$$

$$I_{yy} = 6,170 \text{ cm}^4$$



תגובה / נקודות:

$$V_A = 10.6 \text{ t}$$

$$V_B = 23.4 \text{ t}$$

$$i_x = \frac{20 \cdot 10^3 \cdot 1.2}{265.6} = 90 \frac{\text{kg}}{\text{cm}^2}$$

תגובה נ/כ"מ:

$$i_x = \sqrt{\frac{I_x}{\Sigma A}} = \sqrt{\frac{40,000}{265.6}} = 12.3$$

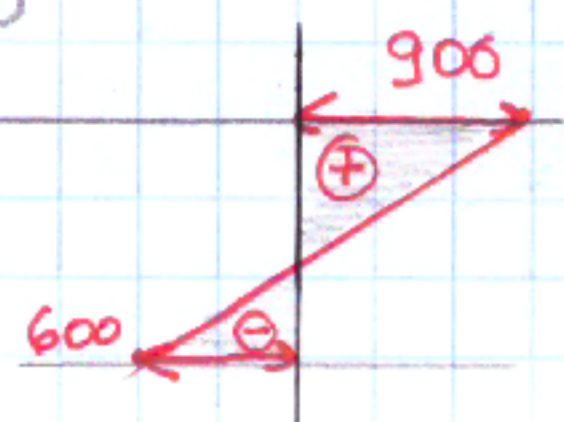
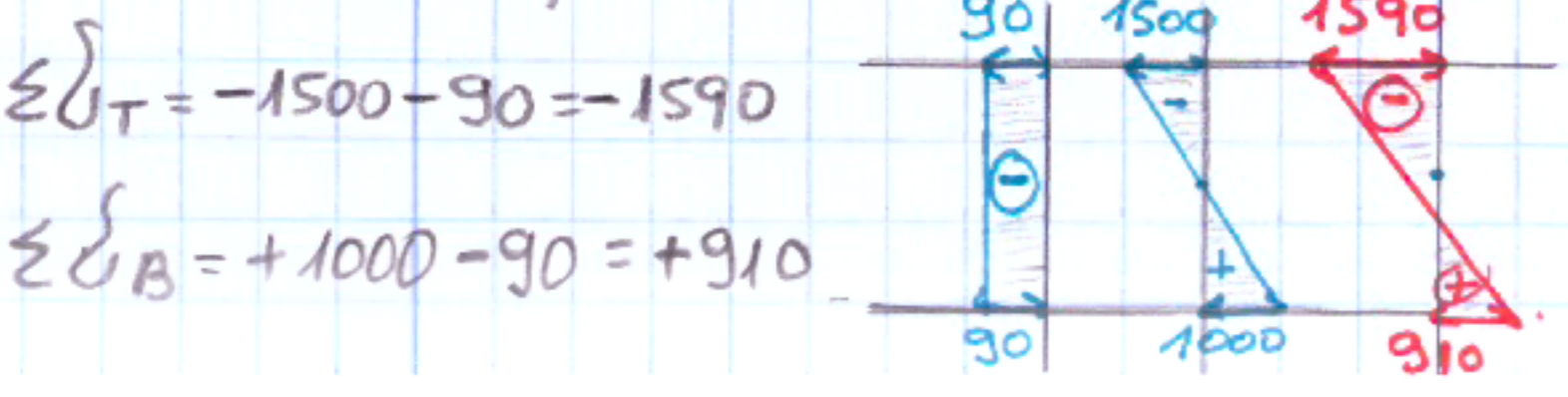
$$\lambda = \frac{600}{12.3} = 49 \Rightarrow \omega = 1.20$$

$$\sigma_T = -30 \cdot 10^5 / 2000 = -1500$$

$$\sigma_B = +30 \cdot 10^5 / 3000 = +1000$$

1)  $\sigma_T = +18 \cdot 10^5 / 2000 = +900 \frac{\text{kg}}{\text{cm}^2}$

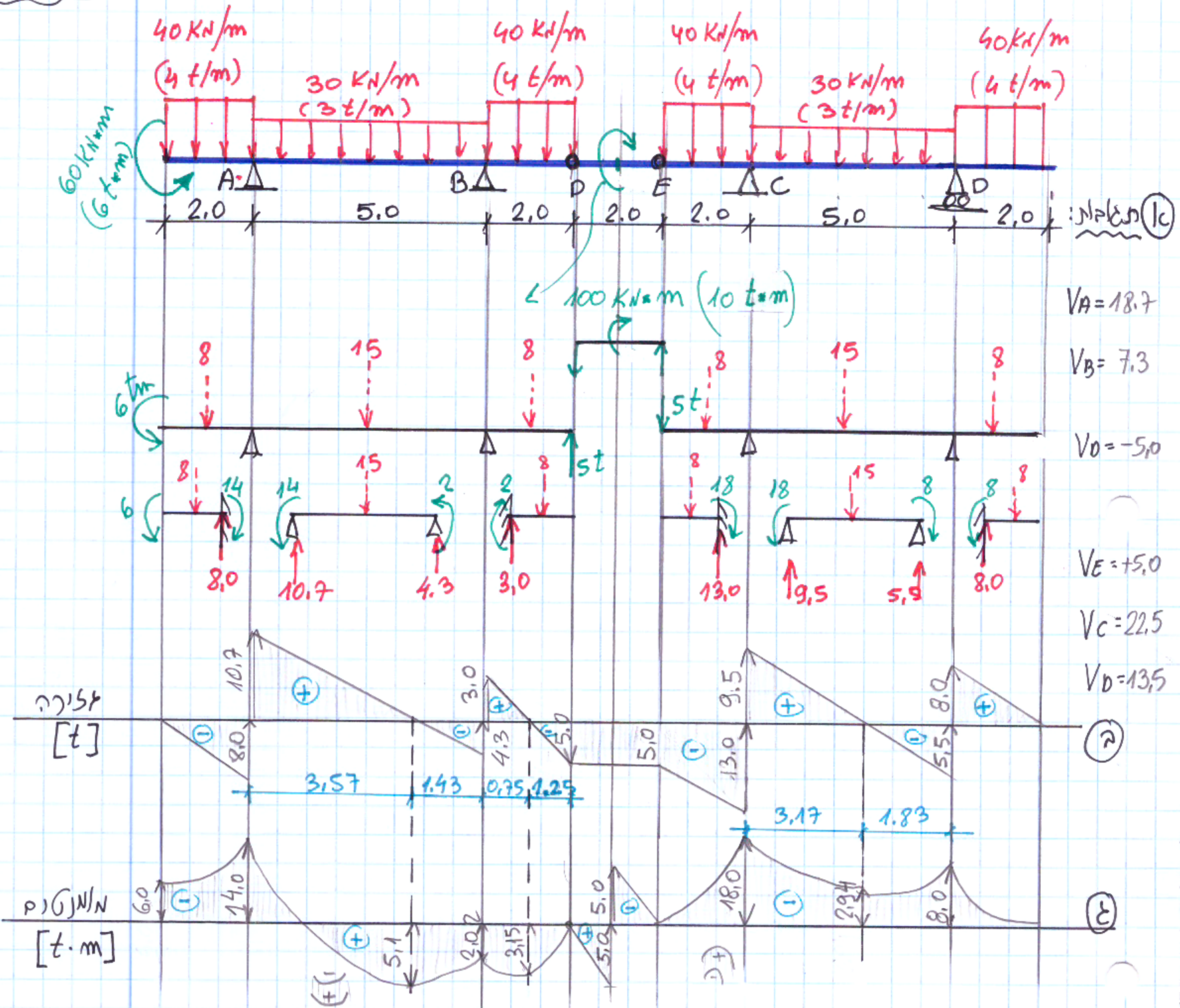
$$\sigma_B = -18.0 \cdot 10^5 / 3000 = -600$$



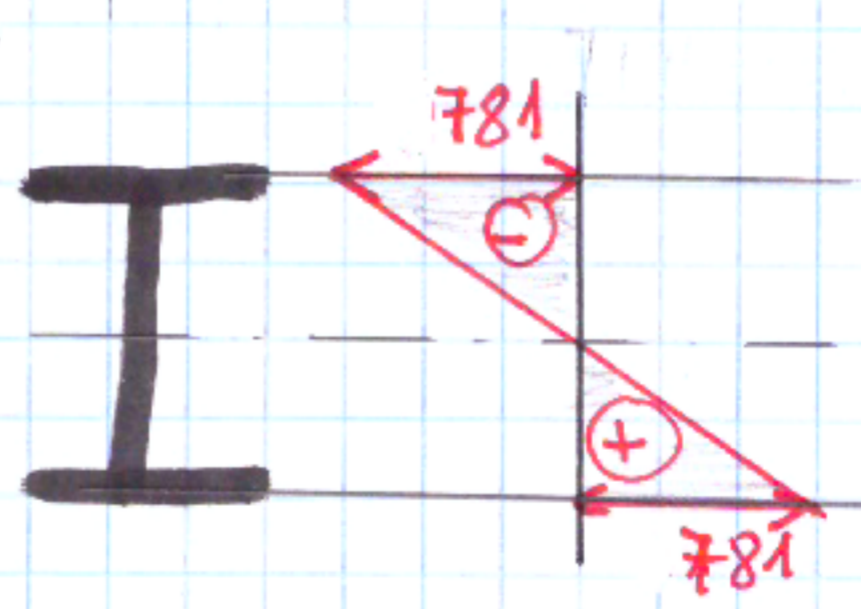
$$\Sigma \sigma_T = -1500 - 90 = -1590$$

$$\Sigma \sigma_B = +1000 - 90 = +910$$

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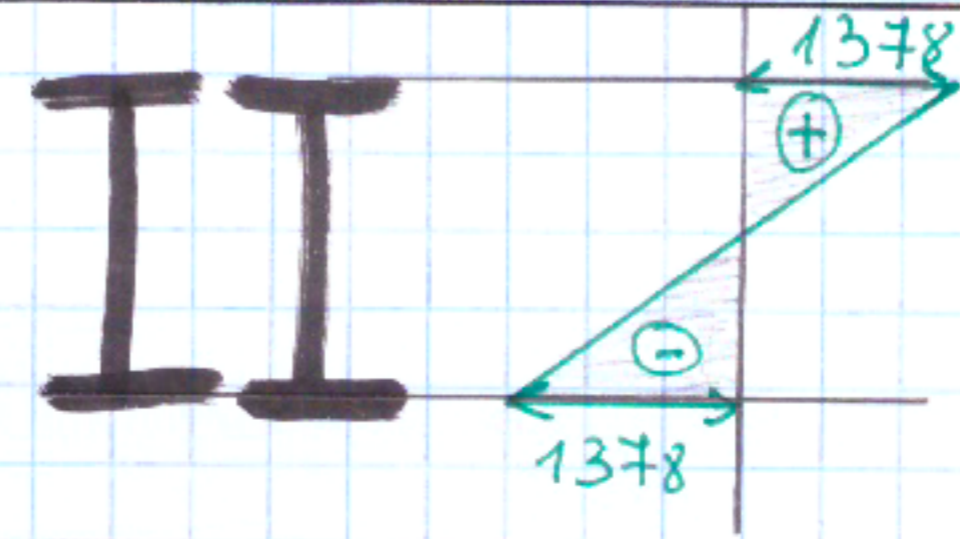


$I_x = 9800 \text{ cm}^4$   
 $W_x = 653 \text{ cm}^3$   
 $\sigma = \frac{5.1 \cdot 10^5}{653} = 781 \frac{\text{kg}}{\text{cm}^2}$



תמונה נוסף (א)  
 IPN 300  
 $M^{(+)} = 5.1 \text{ t.m}$

$W_x = 2 \cdot 653 = 1306 \text{ cm}^3$   
 $\sigma = \frac{18 \cdot 10^5}{1306} = 1378 \frac{\text{kg}}{\text{cm}^2}$



תמונה נוסף (ב)  
 IPN 300  
 $M^{(-)} = 18.0 \text{ t.m}$

