

**予習** 授業の前にやっておこう！

1.

予習(a)

鉛直方向のつり合いは、

$$\sum V = 0 : V_A + V_B - P = 0$$

モーメントのつり合いを点 A で考えると、

$$\sum M_{(A)} = 0 : -V_B \times l + P \times \frac{l}{2} = 0$$

したがって、

$$V_A = \frac{P}{2}, \quad V_B = \frac{P}{2}$$

となる。

予習(b)

鉛直方向のつり合いは、

$$\sum V = 0 : V_A + V_B - P = 0$$

モーメントのつり合いを点 A で考えると、

$$\sum M_{(A)} = 0 : -V_B \times l + P \times \frac{2l}{3} = 0$$

したがって、

$$V_A = \frac{P}{3}, \quad V_B = \frac{2P}{3}$$

となる。

予習(c)

鉛直方向のつり合いは、

$$\sum V = 0 : V_A + V_B - P = 0$$

モーメントのつり合いを点 A で考えると、

$$\sum M_{(A)} = 0 : -V_B \times l + P \times \frac{3l}{4} = 0$$

したがって、

$$V_A = \frac{P}{4}, \quad V_B = \frac{3P}{4}$$

となる。

予習(d)(e)(f)

鉛直方向のつり合いは、

$$\sum V = 0 : V_A + V_B = 0$$

モーメントのつり合いを点 A で考えると、

$$\sum M_{(A)} = 0 : -V_B \times l + M = 0$$

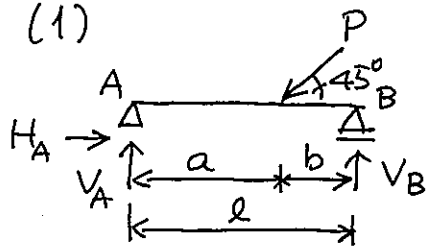
したがって、

$$V_A = -\frac{M}{l}, \quad V_B = \frac{M}{l}$$

となる。

4-A1

(1)



$$\sum H = 0: H_A - P \cos 45^\circ = 0$$

$$H_A = \frac{\sqrt{2}}{2} P$$

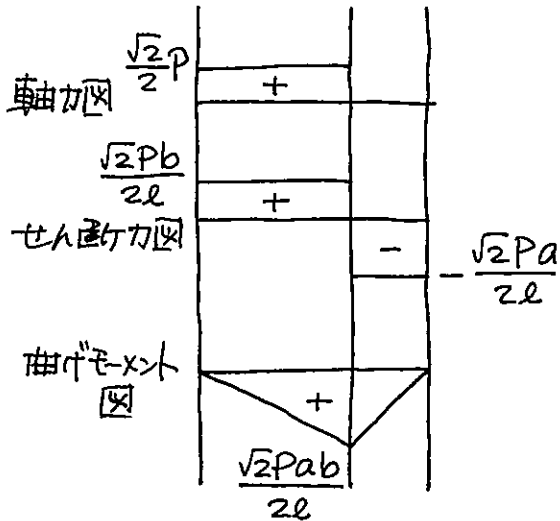
$$\sum M_{(A)} = 0: P \sin 45^\circ \times a - V_B l = 0$$

$$V_B = -\frac{\sqrt{2} P a}{2l}$$

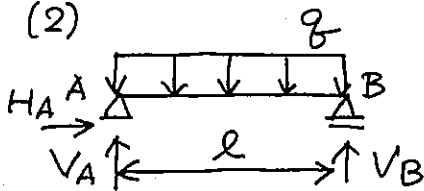
$$\sum M_{(B)} = 0: V_A l - P \sin 45^\circ \times b = 0$$

$$V_A = \frac{\sqrt{2} P b}{2l}$$

$$M_{\max} = \frac{\sqrt{2} P b}{2l} \times a = \frac{\sqrt{2} P a b}{2l}$$



(2)



$$\sum H = 0: H_A = 0$$

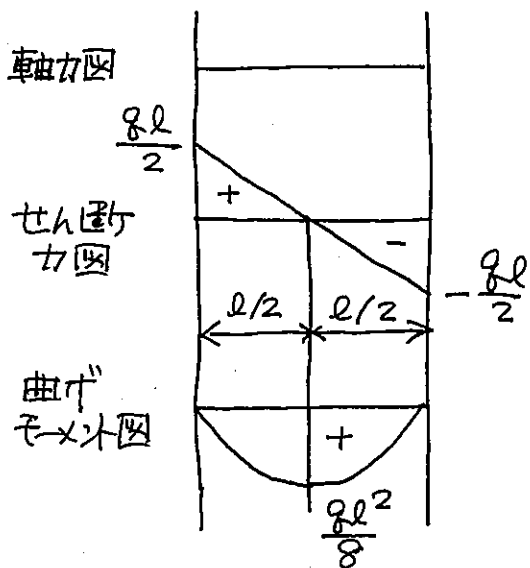
$$\sum M_{(A)} = 0: q l \times \frac{l}{2} - V_B l = 0$$

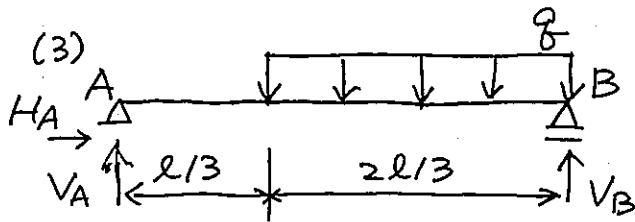
$$V_B = \frac{q l}{2}$$

$$\sum V = 0: V_A + V_B - q l = 0$$

$$V_A = q l - V_B = \frac{q l}{2}$$

$$M_{\max} = \frac{q l}{2} \times \frac{1}{2} \times \frac{l}{2} = \frac{q l^2}{8}$$





$$\sum H=0: H_A=0$$

$$\sum M_{(A)}=0: \frac{2ql}{3} \times \frac{l}{3} - V_B l = 0$$

$$V_B = \frac{2}{9} ql$$

$$\sum M_{(B)}=0: V_A l - \frac{2}{3} ql \times \frac{l}{6} = 0$$

$$V_A = \frac{1}{9} ql$$

$$\left( \sum V=0: V_A + V_B = \frac{ql}{3} \rightarrow OK \right)$$

$$M_{max} = \frac{1}{2} \times \frac{2}{9} ql \times \frac{4}{9} l$$

$$= \frac{4}{81} ql^2$$

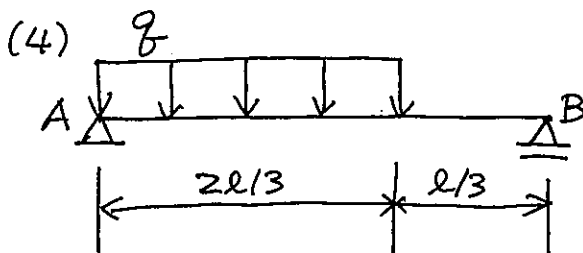
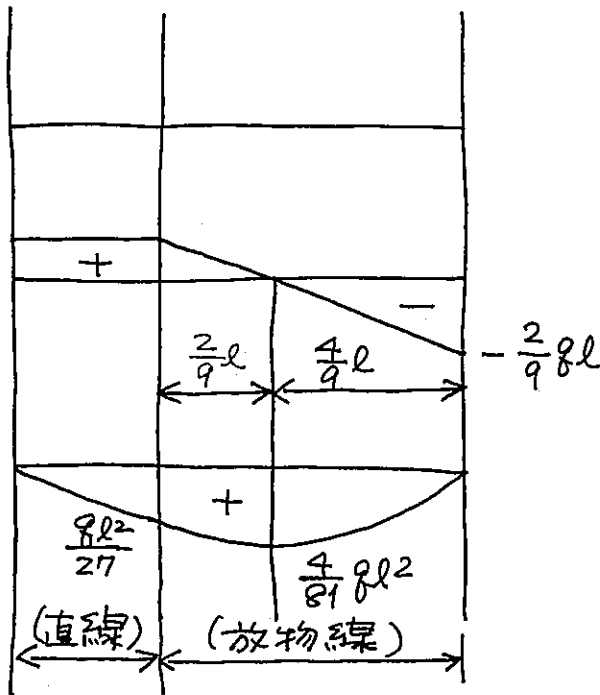
$$\left( M_{max} = \frac{ql}{9} \times \frac{l}{3} + \frac{1}{2} \times \frac{ql}{9} \times \frac{2}{9} l \right)$$

$$= \frac{ql^2}{27} + \frac{ql^2}{81} = \frac{4}{81} ql^2 \rightarrow OK$$

軸力図

せん断力図

曲げモーメント図



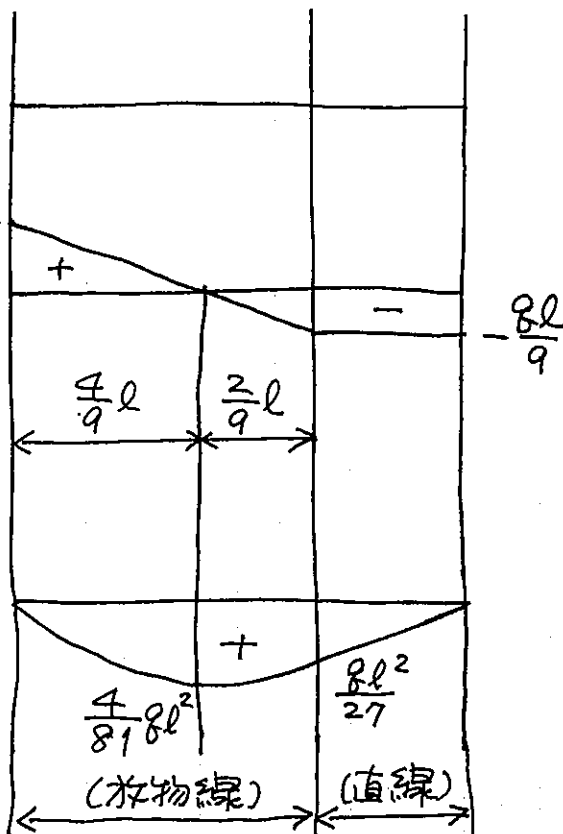
明らかに,

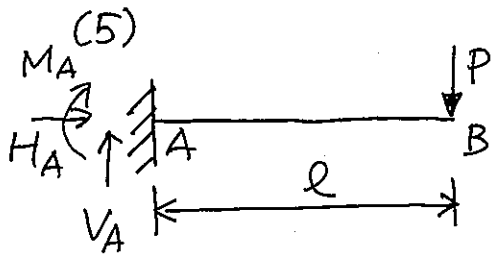
$$H_A=0, V_A = \frac{2}{9} ql, V_B = \frac{1}{9} ql$$

軸力図

せん断力図

曲げモーメント図





$$\sum H = 0 : H_A = 0$$

$$\sum V = 0 : V_A - P = 0$$

$$V_A = P$$

$$\sum M_{(A)} = 0 : M_A + Pl = 0$$

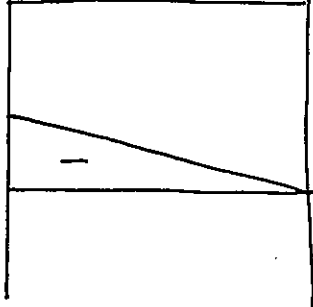
$$M_A = -Pl$$

軸力図

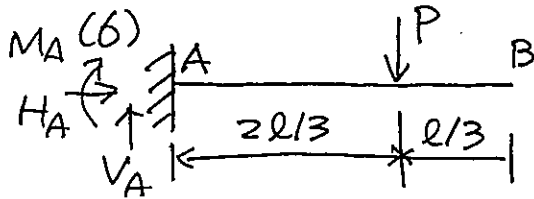
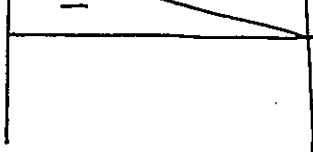


せん断力図

$-Pl$



曲率  
モーメント  
図



$$\sum H = 0 : H_A = 0$$

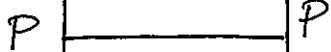
$$\sum V = 0 : V_A - P = 0$$

$$V_A = P$$

$$\sum M_{(A)} = 0 : M_A + P \times \frac{2}{3}l = 0$$

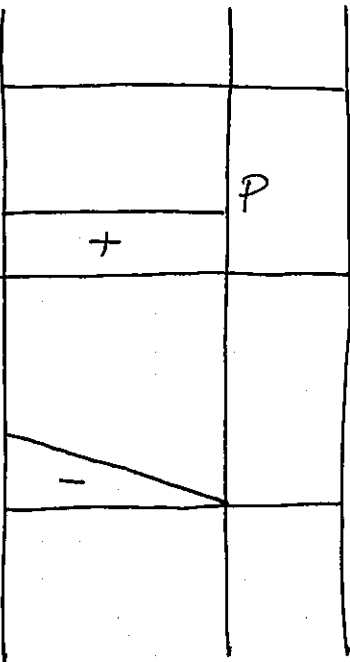
$$M_A = -\frac{2}{3}Pl$$

軸力図

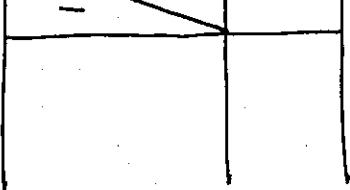


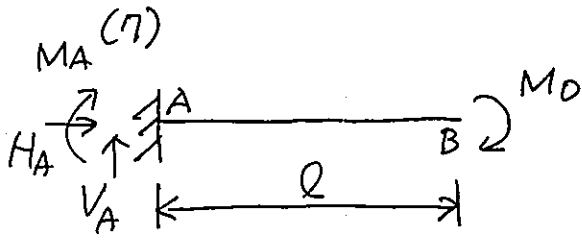
せん断力図

$-\frac{2}{3}Pl$



曲率  
モーメント  
図



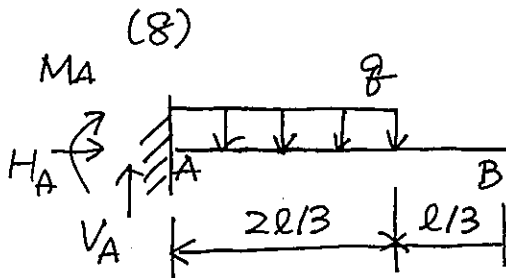
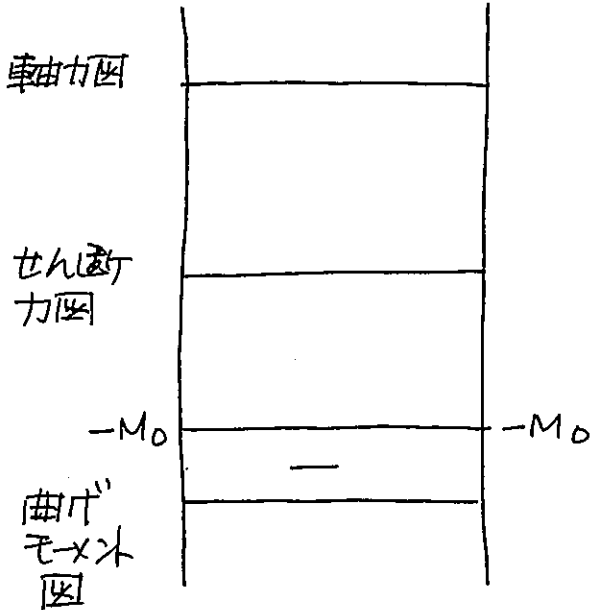


$$\sum H = 0 : H_A = 0$$

$$\sum V = 0 : V_A = 0$$

$$\sum M_{(A)} = 0 : M_A + M_0 = 0$$

$$M_A = -M_0$$



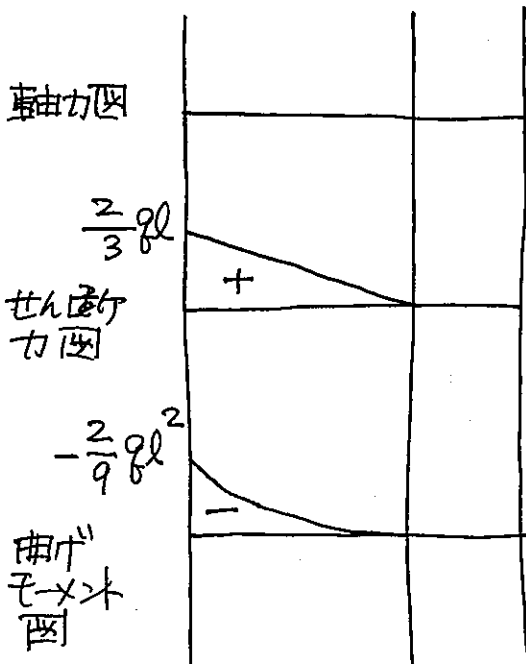
$$\sum H = 0 : H_A = 0$$

$$\sum V = 0 : V_A - \frac{2}{3}ql = 0$$

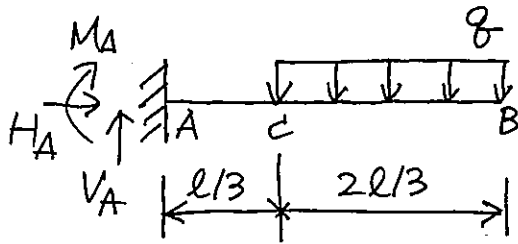
$$V_A = \frac{2}{3}ql$$

$$\sum M_{(A)} = 0 : M_A + \frac{2}{3}ql \times \frac{l}{3} = 0$$

$$M_A = -\frac{2}{9}ql^2$$



(9)



$$\Sigma H=0: H_A=0$$

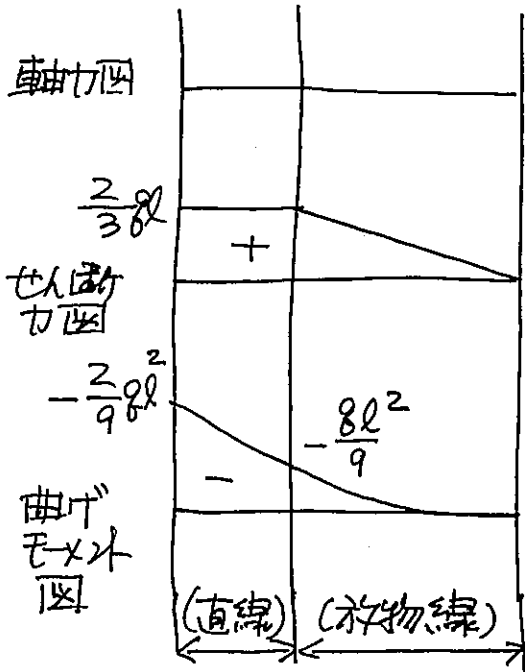
$$\Sigma V=0: V_A - \frac{2}{3}ql = 0$$

$$V_A = \frac{2}{3}ql$$

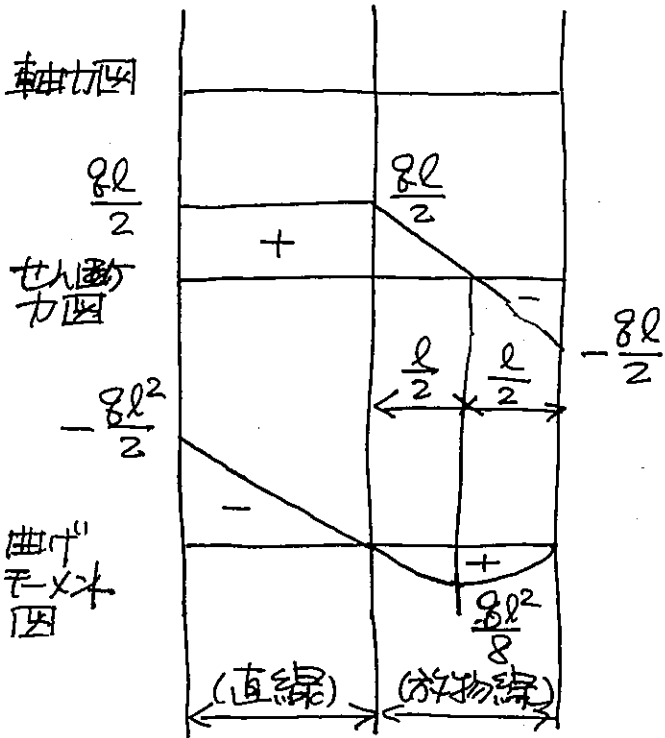
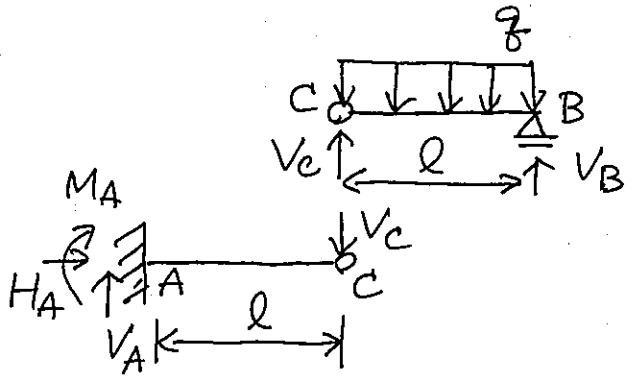
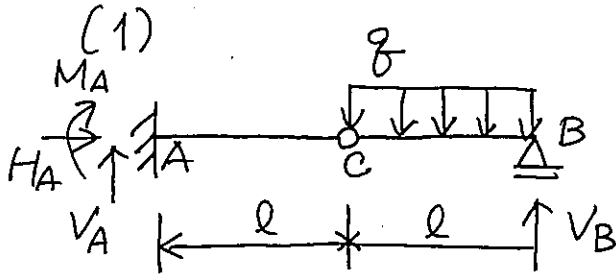
$$\Sigma M_{(A)}=0: M_A + \frac{2}{3}ql \times \frac{2}{3}l = 0$$

$$M_A = -\frac{2}{9}ql^2$$

$$M_C = -\frac{1}{2} \times \frac{2}{3}ql \times \frac{2}{3}l = -\frac{1}{9}ql^2$$



4-B1



(i) はり CB

$$V_B = V_C = \frac{8l}{2}$$

(ii) はり AC

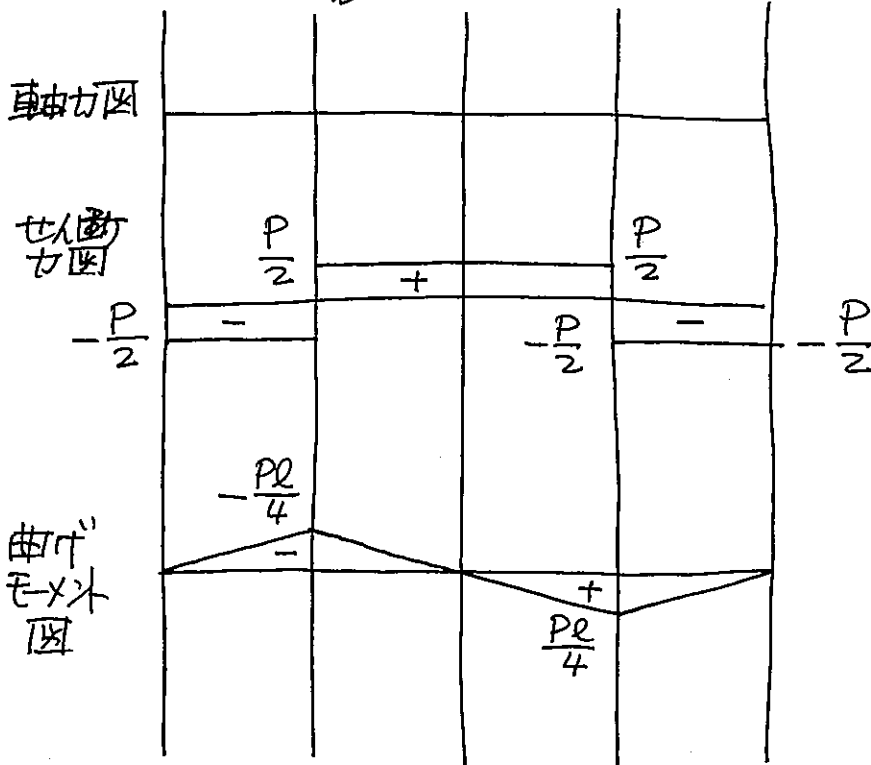
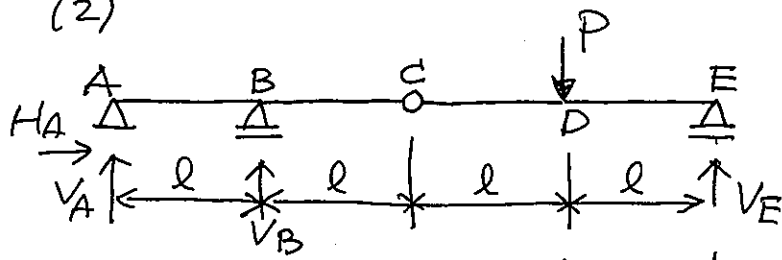
$$H_A = 0$$

$$V_A = V_C = \frac{8l}{2}$$

$$M_A = -V_C l = -\frac{8l^2}{2}$$



(2)



(i) 1) CE  
 $V_C = V_E = \frac{P}{2}$

(ii) 1) ABC

$H_A = 0$

$\sum M_{(A)} = 0: V_C \times 2l - V_B l = 0$

$V_B = 2V_C = P$

$\sum V = 0:$

$V_A + V_B - V_C = 0$

$V_A = V_C - V_B = -\frac{P}{2}$