

09/11/2013

Exercice 11.1  $\rightarrow 0,5$ 

$$1.2. \sum X_i = 0 \Leftrightarrow X_A - F/\sqrt{2} \times \frac{\sqrt{2}}{2} = 0 \Leftrightarrow \boxed{X_A = F/2}$$

$$\sum Y_i = 0 \Leftrightarrow Y_A + Y_B - \frac{F}{2} - 2qa - 2F - F/\sqrt{2} \times \frac{\sqrt{2}}{2} = 0 \quad 2,5$$

$$\sum M_{z/A} = 0 \Leftrightarrow Y_B \times 2a + \frac{F}{2} \times a - 2F \times a - 2qa \times a - \frac{F}{2} \times 3a = 0$$

$$\Leftrightarrow 2Y_B = -\frac{F}{2} + 2F + 2qa + \frac{3F}{2}$$

$$2Y_B = 3F + 2qa \Leftrightarrow \boxed{Y_B = \frac{3F}{2} + qa}$$

$$\sum Y_i = 0 \Leftrightarrow Y_A = \frac{F}{2} + 2qa + 2F + \frac{F}{2} - Y_B$$

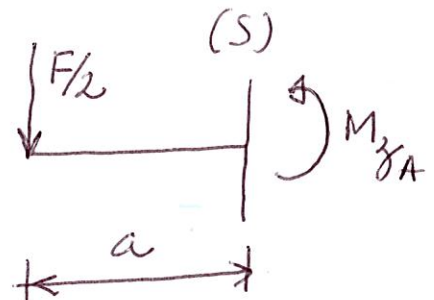
$$Y_A = \frac{7F}{2} + 2qa - \frac{3F}{2} - qa$$

$$\boxed{Y_A = \frac{3F}{2} + qa}$$

Le chargement est symétrique/y.

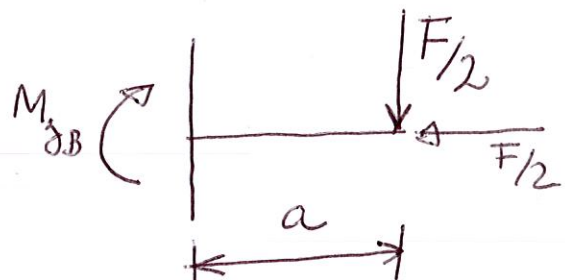
$$1.3. M_{zA} + \frac{F}{2} \times a = 0$$

$$\boxed{M_{zA} = -\frac{F}{2}a} \quad 1,5$$



$$-M_{zB} - \frac{F}{2} \times a = 0$$

$$\boxed{M_{zB} = -\frac{Fa}{2}} \quad 1,5$$



1.4.

$$\boxed{N_{xI} = -X_A = -F/2} \quad 1$$

1.5.

$$Y_A = \frac{3 \times 12}{2} + 4 \times 6 \Leftrightarrow Y_A = 42 \text{ kN}$$

$$Y_B = \frac{3 \times 12}{2} + 4 \times 6 \Leftrightarrow Y_B = 42 \text{ kN} \quad 1$$

$$M_{zA} = - \frac{12 \times 6}{2} = -36 \text{ kN.m}$$

$$M_{zB} = - \frac{12 \times 6}{2} = -36 \text{ kN.m}$$

$$N_{2I} = -6 \text{ kN}$$

Exercice 2 2.1 - 0,5)

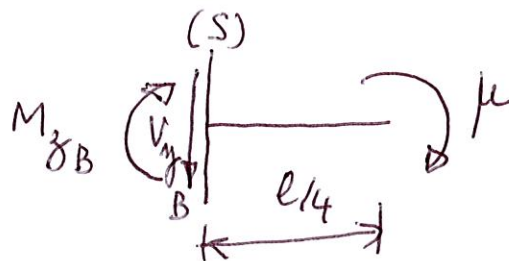
$$2.2. \sum X_i = 0 \Leftrightarrow X_A = 0$$

$$\sum Y_i = 0 \Leftrightarrow Y_A - q \times \frac{3l}{4} = 0 \Leftrightarrow Y_A = \frac{3ql}{4} \quad 2,5$$

$$\sum M_{zi/A} = 0 \Leftrightarrow \mu_A - \frac{3ql}{4} \times \frac{3l}{8} - \mu = 0$$

$$\mu_A = \frac{9ql^2}{32} + \mu$$

2.3.



$$-V_{yB} + 0 = 0$$

$$V_{yB} = 0$$

$$-M_{zB} - \mu = 0$$

$$M_{zB} = -\mu$$

1

### Exercice 3

3.1.  $N_e = 3$   $N_i = 3$   $N_{dl} = 6$

$n = 0 \Rightarrow$  structure isostatique 1

3.2  $\rightarrow 0,5$

3.3.  $\sum X_i = 0 \Leftrightarrow X_A - F = 0 \Leftrightarrow X_A - q \frac{l}{2} = 0 \Leftrightarrow X_A = \frac{ql}{2}$

$\sum Y_i = 0 \Leftrightarrow Y_A + Y_C - 2F - ql = 0 \Leftrightarrow Y_A + Y_C - ql - ql = 0$

$\sum M_{ji/A} = 0 \Leftrightarrow Y_C \times l - ql \times (l + \frac{l}{2}) + F \times \frac{l}{2} = 0$

$Y_C \times l = \frac{3ql^2}{2} - \frac{ql^2}{4} \Leftrightarrow Y_C = \frac{5ql}{4}$  2,5

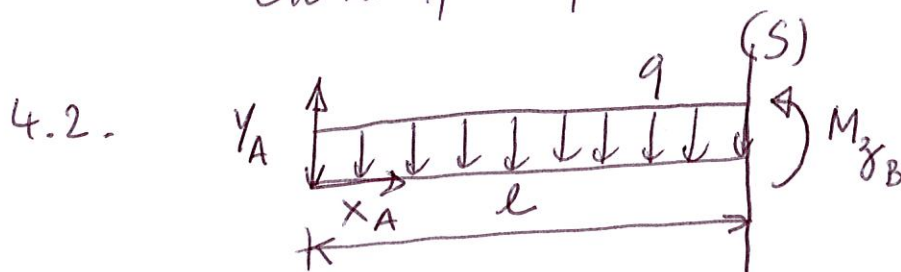
$\sum Y_i = 0 \Leftrightarrow Y_A = 2ql - Y_C \Leftrightarrow Y_A = \frac{3ql}{4}$

### Exercice 4

4.1.  $N_e = 4$   $N_i = 0$   $N_{dl} = 3$

①  $n = 1$  structure hyperstatique

On ne peut pas résoudre avec le PFS.



$M_{B} - Y_A \times l + ql \times \frac{l}{2} = 0$  ②

$M_B = Y_A l - \frac{ql^2}{2}$

4.3.

$$Y_A \cdot l - \frac{ql^2}{2} = -\frac{ql^2}{16}$$

$$Y_A \cdot l = -\frac{ql^2}{16} + \frac{ql^2}{2}$$

$$Y_A = \frac{7ql}{16} \quad (1)$$

4.4.  $\sum X_i = 0 \Leftrightarrow X_A = 0$

$$\sum Y_i = 0 \Leftrightarrow Y_A + Y_B + Y_C - ql = 0$$

$$\sum M_{\text{giri}/C} = 0 \Leftrightarrow -Y_B \times l - Y_A \times 2l + ql \times (l + \frac{l}{2}) = 0$$

$$Y_B l = \frac{3ql^2}{2} - Y_A \cdot 2l \Leftrightarrow Y_B = \frac{3ql}{2} - \frac{7ql}{8}$$

$$Y_B = \frac{5ql}{8} \quad (2)$$

$$\sum Y_i = 0 \Leftrightarrow Y_C = ql - Y_A - Y_B \Leftrightarrow Y_C = ql - \frac{7ql}{16} - \frac{5ql}{8}$$

$$Y_C = -\frac{ql}{16}$$