MINISTERE DE L'ENSEIGNEMENT SUPERIEUR ET DE LA RECHERCHE SCIENTIFIQUE
UNIVERSITE BATNA 2
FACULTE DE TECHNOLOGIE
DEPARTEMENT D'ELECTROTECHNIQUE

2ème Année Licence ELM

CORRIGE TYPE
RESISTANCE DES MATERIAUX (RDM)
Semestre : 04 (2021-2022)

Exercice N01 (6pts)

Données :

- **d= 24 mm** **F= 8.10⁴ N**

Contrainte de cisaillement du boulon

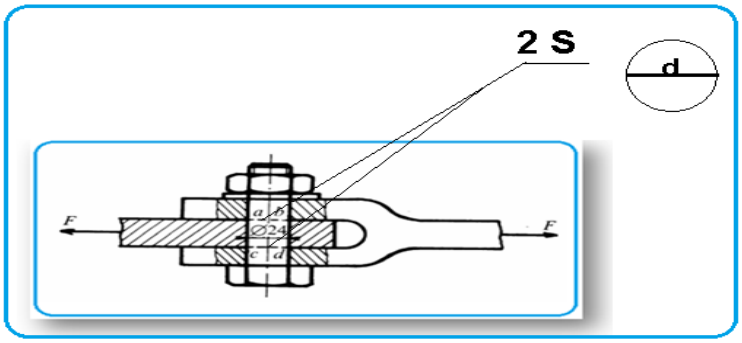


Figure 1

On a :

$$\tau = T/S_t \ldots.(A) \quad (1)$$

Avec :

$$T=F\ldots.(a)$$

$$S_t = 2S = 2\left(\Pi\frac{d^2}{4}\right) = \left(\Pi\frac{d^2}{2}\right)\ldots.(b) \quad (2)$$

(a) et (b) dans (A) donne :

$$\tau = F/\left(\Pi\frac{d^2}{2}\right) \quad (1)$$

$$AN/ \quad \tau = 8.10^4/\left(\Pi\frac{24^2}{2}\right)$$

$$\tau = 88.41MPa \quad (2)$$

Exercice N 02 (14pts)

Données :

F_1 = 45KN et **F_3 = 450KN**

S_1 = 625mm², **S_2= 2500mm²** et **S_3= 1250mm²**

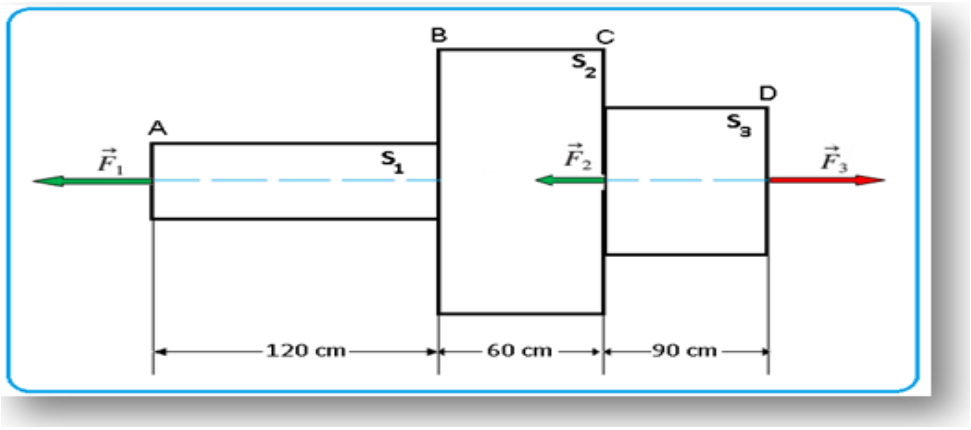


Figure 2

1- **Valeur de l'effort F_2**

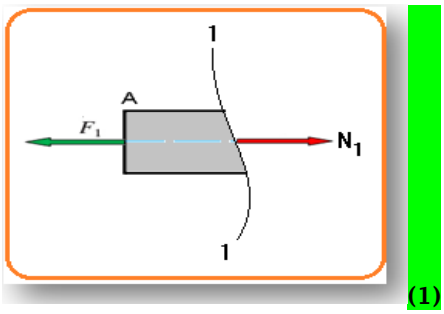
Equilibre de larbre : $\vec{F_1} + \vec{F_2} + \vec{F_3} = \vec{0}$

Ox : $-F_1 - F_2 + F_3 = 0 \Rightarrow F_2 = 450 - 45$ **(0.5)**

$\Rightarrow \boldsymbol{F_2 = 405\ KN}$ **(1)**

2/- **Contrainte normale maximale σ** dans l'arbre

- Coupure 1-1 : $0 < x < 120\ cm$ **(0.5)**



(1)

$\sum F = 0 \Rightarrow N_1 - 45 = 0$

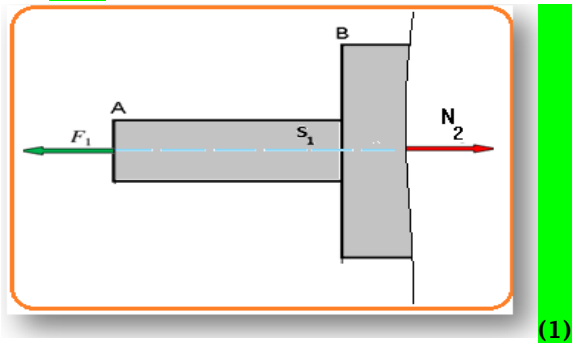
$\Rightarrow \boldsymbol{N_1 = 45KN}$ **(0.5)**

$\boldsymbol{N_1 > 0}$ ***traction*** **(0.5)**

$\nabla_1 = \frac{N_1}{S_1} = \frac{45\times10^3}{625} \Rightarrow \nabla_1 = 72\ \mathrm{N/mm^2}$ **(0.5)**

$\boldsymbol{\nabla_1 = 72\ MPa}$ **(0.5)**

Coupure 2-2 : $120cm < x < 180cm$ **(0.5)**



(1)

$\sum F = 0 \Rightarrow N_2 - 45 = 0$

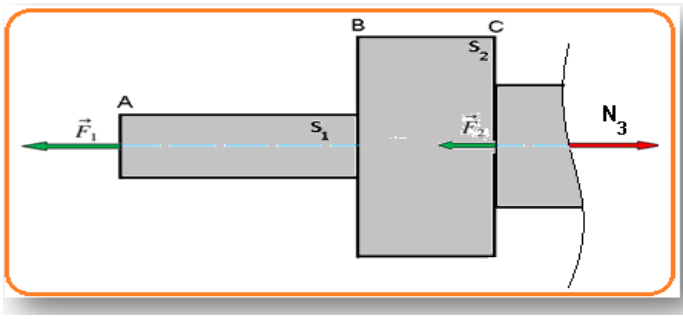
$\Rightarrow \boldsymbol{N_2 = 45KN}$ **(0.5)**

$\boldsymbol{N_2 > 0\ traction}$ **(0.5)**

$\nabla_2 = \frac{N_2}{S} \Rightarrow \nabla_2 = \frac{45\times10^3}{2500} = 18\text{N/mm}^2$ **(0.5)**

$\Rightarrow \boldsymbol{\nabla_2 = 18\ MPa}$ **(0.5)**

Coupure 3-3 : $180\text{cm} < x < 270cm$ **(0.5)**



(1)

$\sum F = 0 \Rightarrow -F_1 - F_2 + N_3 = 0 \Rightarrow N_3 = F_1 + F_2$

$\Rightarrow N_3 = 45 + 405$

$\Rightarrow \boldsymbol{N_3 = 450\ KN}$ **(0.5)**

$\boldsymbol{N_3 > 0\ traction}$ **(0.5)**

$\nabla_3 = \frac{N_3}{S_3} \Rightarrow \nabla_3 = \frac{450\times10^3}{1250}$

$\Rightarrow \nabla_3 = 360N/mm^2$ **(0.5)**

On a : $\nabla_1 = 72N/mm^2 \nabla_2 = 180N/mm^2$

$\boldsymbol{\nabla_3 = 360\ MPa}$ **(0.5)**

La valeur de la contrainte maximale est :

$\nabla_{max} = \nabla_3 = 360N/mm^2$ **(1)**

$\boldsymbol{\nabla_{max} = \nabla_3 = 360\ MPa}$ **(1)**