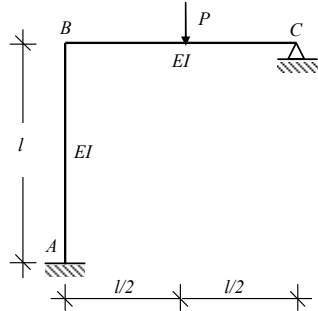


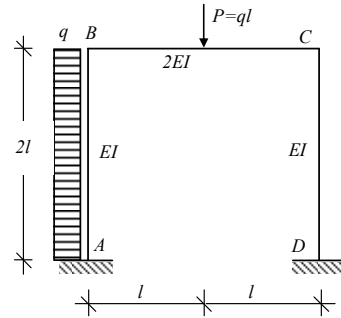
## 5.8 EXERCICES

 Tracer les diagrammes de  $M$ , de  $N$  et de  $T$  des systèmes suivants.

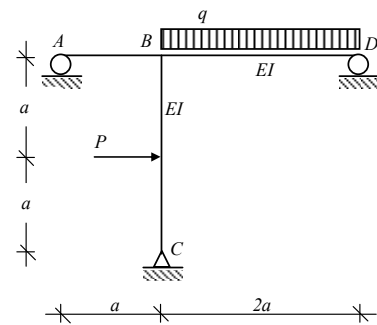
Exercice 5.1



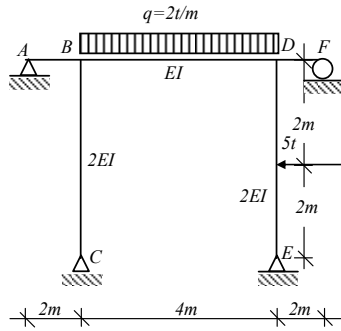
Exercice 5.2



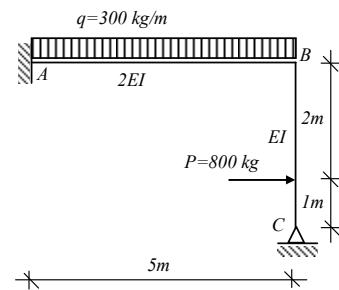
Exercice 5.3



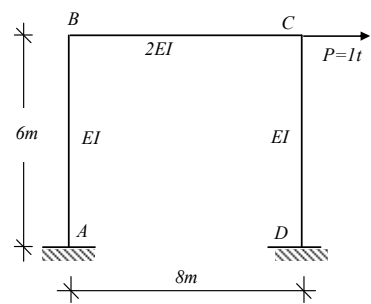
Exercice 5.4



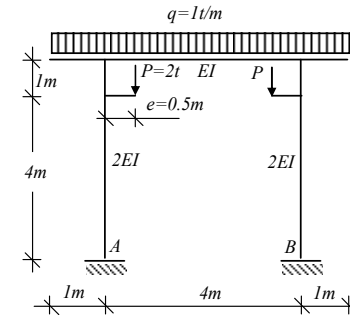
Exercice 5.5



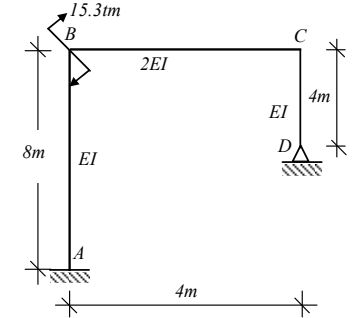
Exercice 5.6



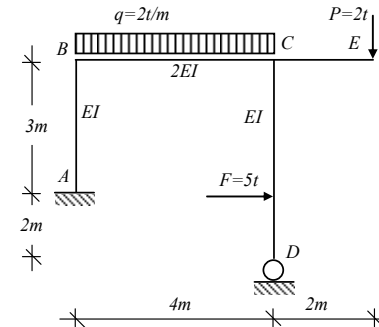
Exercice 5.7



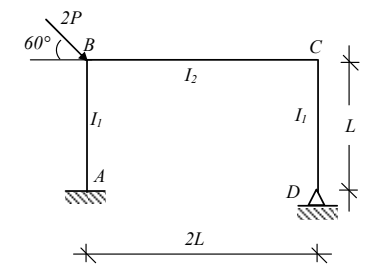
Exercice 5.8



Exercice 5.9

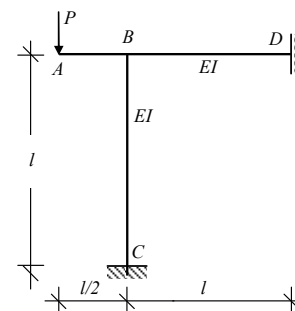


Exercice 5.10

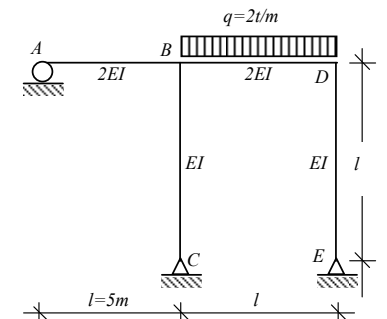


A.N. :  $P = 12t$ ,  $L = 4m$ ,  $I_1 = 10^4 m^4$ ,  
 $I_2 = 8I_1$  et  $E = 2.1 \cdot 10^6 kg/cm^2$ .

Exercice 5.11



Exercice 5.12



**Réponses :**

Exercice 5.1 :  $M_A = 3Pl/56$ ,  $M_B = -6Pl/56$ ,  $R_C^H = -9P/56$ ,  $R_C^V = 22P/56$ .

Exercice 5.2 : Inconnues hyperstatiques au milieu du système :  $X^M = 0.29ql^2$ ,  
 $X^N = -0.53ql$ ,  $X^T = -0.81ql$ . Réactions :  $M^A = -0.85ql^2$ ,  $R_A^H = -1.47ql$ ,  
 $R_A^V = 0.2ql$ ,  $M_D = -0.55ql^2$ ,  $R_D^H = -0.53ql$ ,  $R_D^V = 0.8ql$ .

Exercice 5.3 :  $R_A^V = -(2P+qa)/3$ ,  $R_C^V = (P+3qa)/2$ ,  $R_D^V = (P+5qa)/6$ ,  
 $M_{BA} = -a(2P+qa)/3$ ,  $M_{BC} = Pa$ ,  $M_{BD} = a(P-qa)/3$ .

Exercice 5.4 :  $R_C^H = 0.24t$ ,  $R_C^V = 4.17t$ ,  $R_E^H = 1.63t$ ,  $R_E^V = 4.17t$ .

Exercice 5.5 :  $R_C^H = -540.5kg$ ,  $R_C^V = 569.0kg$ ,  $R_A^H = -259.5kg$ ,  $R_A^V = 931.0kg$ ,  
 $M_A = -926.5kgm$ ,  $M_{BA} = M_{BC} = -21.5 kgm$ .

Exercice 5.6 : Inconnues hyperstatiques au milieu du système :  $X^M = 0$ ,  $X^N = 0.5t$   
 $X^T = -0.34t$ . Moments :  $M_A = M_D = -1.65tm$ ,  $M_{BA} = M_{BC} = 1.35tm$ ,  
 $M_{CB} = M_{CD} = -1.35tm$ .

Exercice 5.7 : Inconnues hyperstatiques au milieu du système :  $X^M = 0.94tm$ ,  
 $X^N = -0.45t$ ,  $X^T = 0$ . Réactions :  $M_A = M_B = 0.69tm$ ,  $R_A^H = -R_B^H = 0.45t$ ,  
 $R_A^V = R_B^V = 5t$ .

Exercice 5.8 : Inconnues hyperstatiques externes en D :  $R_D^H = -0.6t$ ,  $R_D^V = 3.6t$ .  
Moments :  $M_A = 1.5tm$ ,  $M_{BA} = -3.3tm$ ,  $M_{BC} = 12.0tm$ ,  
 $M_{CB} = M_{CD} = -2.4tm$ .

Exercice 5.9 :  $R_D^V = 4.35t$ ,  $R_A^H = -5.0t$ ,  $R_A^V = 5.65t$ ,  $M_A = -10.59tm$ ,  
 $M_{BA} = M_{BC} = 4.41tm$ ,  $M_{CB} = 11tm$ ,  $M_{CD} = 15tm$ ,  $M_{CE} = -4tm$ .

Exercice 5.10 :  $R_D^H = -2.63t$ ,  $R_D^V = 3.53t$ ,  $R_A^H = -12.0t$ ,  $R_A^V = 17.25t$ ,  
 $M_A = -19.76tm$ ,  $M_{BA} = M_{BC} = 17.72tm$ ,  $M_{CB} = M_{CD} = -10.52tm$ .

Exercice 5.11 :  $R_D^H = 3P/8$ ,  $R_D^V = -3P/8$ ,  $M_D = Pl/8$ ,  $R_C^H = -3P/8$ ,  $R_C^V = 11P/8$ ,  
 $M_C = -Pl/8$ ,  $M_{BA} = -Pl/2$ ,  $M_{BC} = Pl/4$ ,  $M_{BD} = -Pl/4$ .

Exercice 5.12 :  $R_A^V = -0.426t$ ,  $R_C^H = 0.266t$ ,  $R_C^V = 5.852t$ ,  $R_E^H = -0.266t$ ,  
 $R_E^V = 4.574t$ ,  $M_{BA} = -2.13tm$ ,  $M_{BC} = -1.33tm$ ,  $M_{BD} = -3.46tm$ ,  
 $M_{DB} = M_{DE} = -1.33tm$ .

Signes : Pour le moment fléchissant et les composantes de réactions, les conventions utilisées sont les suivantes : . un moment est positif s'il fait tendre les fibres intérieures (inférieures) ; . une réaction verticale ( $R^V$ ) est positive si elle agit vers le haut alors qu'une réaction horizontale ( $R^H$ ) est positive quand elle est dirigée vers la droite. Pour les inconnues hyperstatiques ( $X^N$  et  $X^T$ ), on utilise les conventions habituelles de  $N$  et  $T$ .