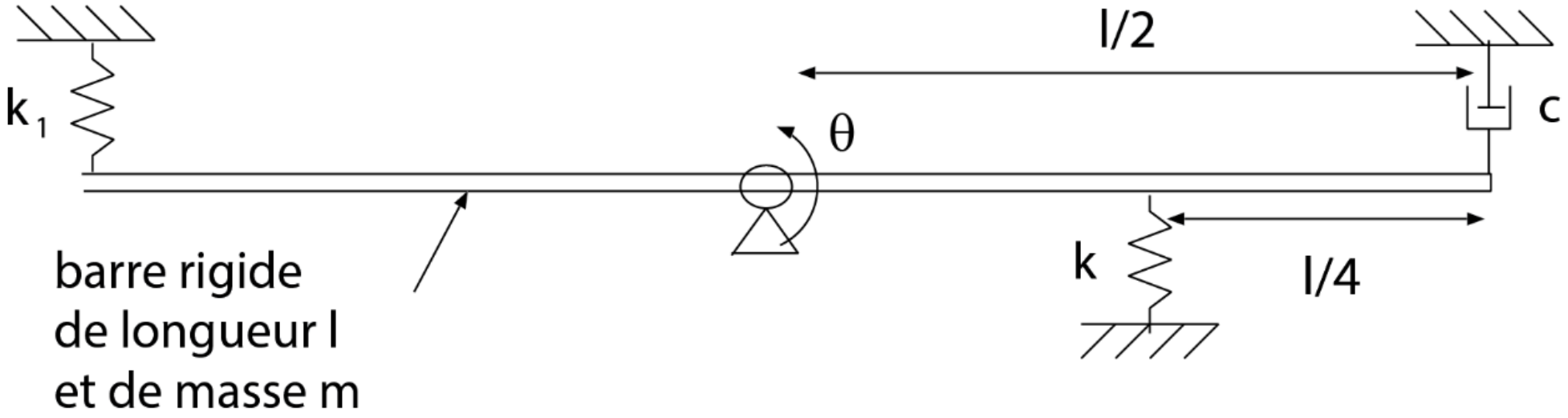
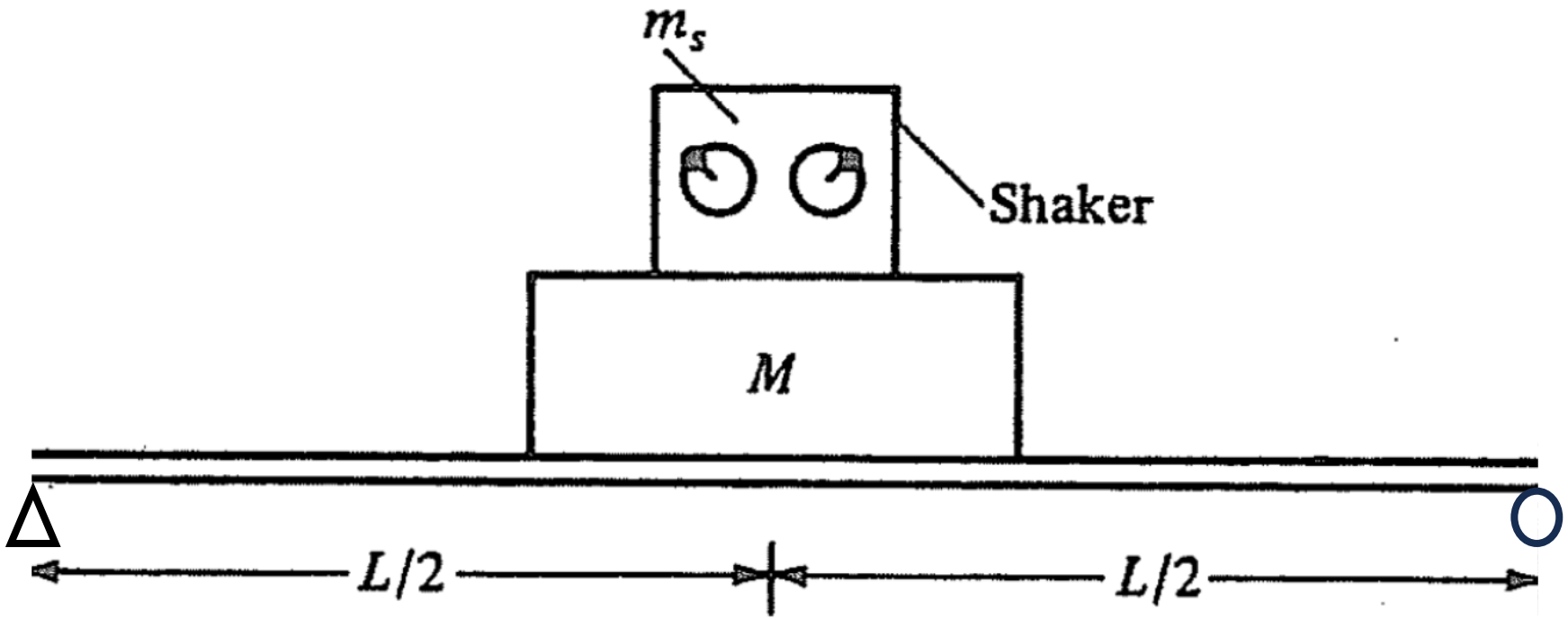
Question 5 :

1. Ecrire l'équation régissant le mouvement de la barre ci-dessous en prenant son angle θ comme variable décrivant le mouvement. Le moment d'inertie de la barre en son centre est $I=ml^2/12$
2. A partir de l'équation du mouvement, et en faisant l'hypothèse que θ reste faible pendant le mouvement, donner l'expression de la (des) fréquence(s) de résonance du système.

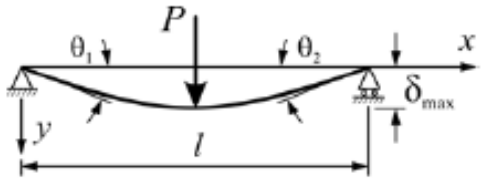
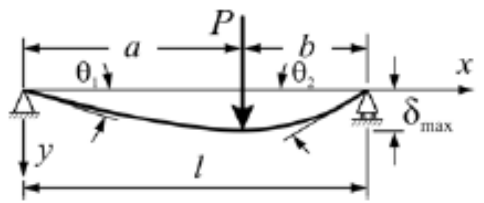
Fréquence propre ?



Rotating masses m, distance L
ms=mass of shaker without rotating masses



- A shaker with two counter-rotating unbalanced masses on a mass resting on a massless elastic floor
- Calculate the magnitude of the response as a function of the excitation frequency of the shaker

BEAM TYPE	SLOPE AT ENDS	DEFLECTION AT ANY SECTION IN TERMS OF x	MAXIMUM AND CENTER DEFLECTION
6. Beam Simply Supported at Ends – Concentrated load P at the center			
	$\theta_1 = \theta_2 = \frac{Pl^2}{16EI}$	$y = \frac{Px}{12EI}\left(\frac{3l^2}{4} - x^2\right)$ for $0 < x < \frac{l}{2}$	$\delta_{max} = \frac{Pl^3}{48EI}$
7. Beam Simply Supported at Ends – Concentrated load P at any point			
	$\theta_1 = \frac{Pb(l^2 - b^2)}{6lEI}$ $\theta_2 = \frac{Pab(2l - b)}{6lEI}$	$y = \frac{Pbx}{6lEI}\left(l^2 - x^2 - b^2\right)$ for $0 < x < a$ $y = \frac{Pb}{6lEI}\left[\frac{l}{b}(x-a)^3 + \left(l^2 - b^2\right)x - x^3\right]$ for $a < x < l$	$\delta_{max} = \frac{Pb\left(l^2 - b^2\right)^{3/2}}{9\sqrt{3}\,lEI}$ at $x = \sqrt{\left(l^2 - b^2\right)/3}$ $\delta = \frac{Pb}{48EI}\left(3l^2 - 4b^2\right)$ at the center, if $a > b$