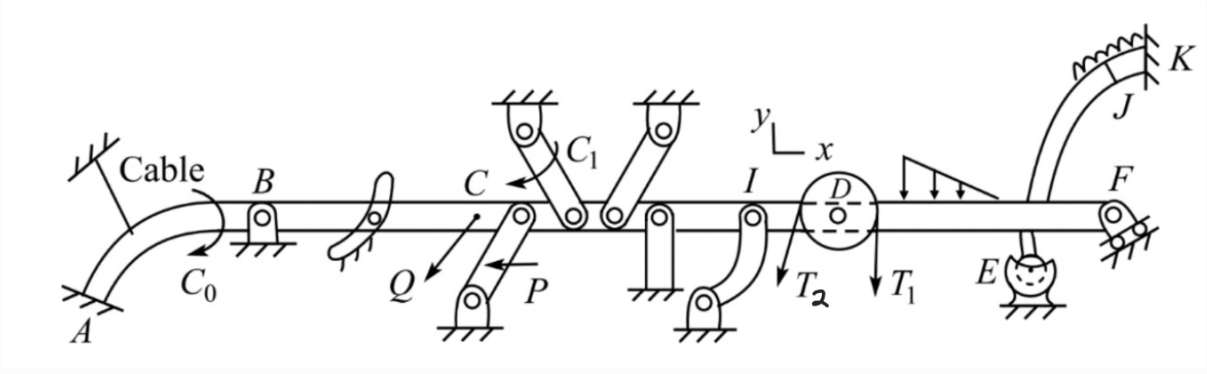
Tutorial 5

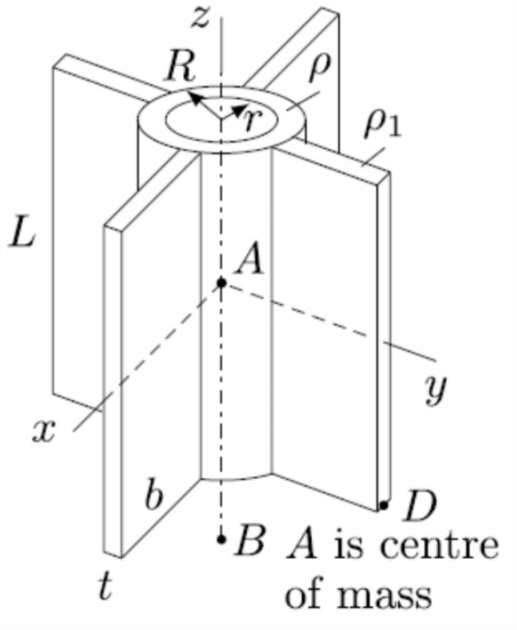
Part A

1) Draw the FBD and show the reaction force and torque components exerted by supports on member ABCDEF



2) Find the inertia matrix $[\underline{\underline{I}}^A]$ of the composite RB at A relative to csys shown.

Density of annulus is ρ and that of plates is ρ_1.

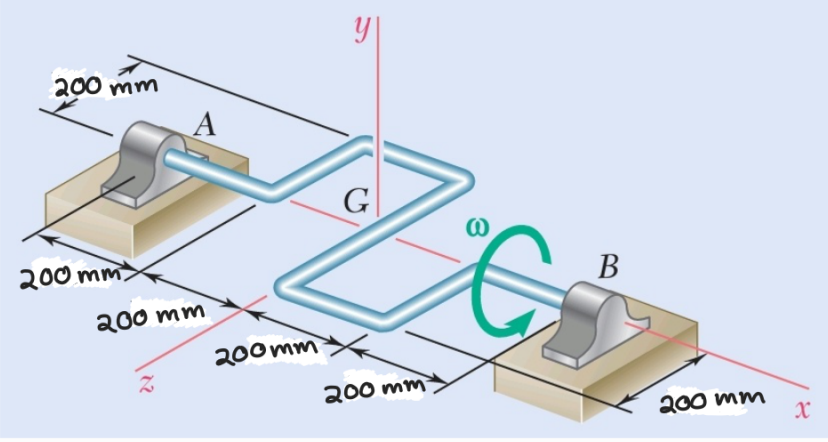


Find principal axes of the composite RB at point A, B, and D.

3) Find the angular momentum of the shaft about point A and w.r.t. ground with $\hat{e}_1 - \hat{e}_2 - \hat{e}_3$ as csys.

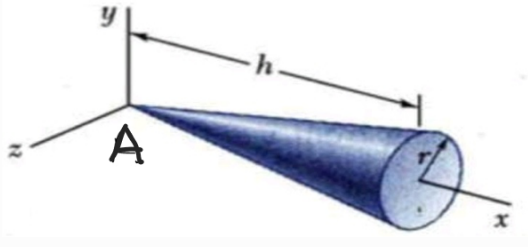
Mass of the shaft = 8 kg

Angular velocity = 12 rad/s



Part B

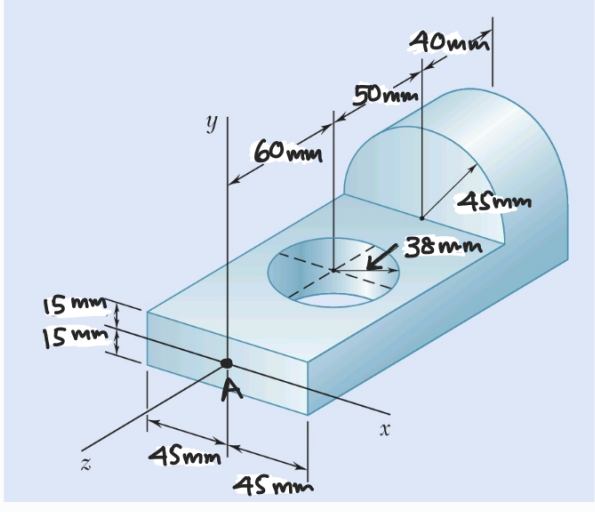
1) Find I_{xx}^A, I_{yy}^A, and I_{zz}^A



Ans: $I_{xx}^A = \frac{3}{10} ma^2$,

$I_{yy}^A = I_{zz}^A = \frac{3}{5} m\left(\frac{1}{4}a^2 + h^2\right)$

2) Find I_{11}^A relate to csys x-y-z and also find the radius of gyration



Ans: $I_{11}^A = 38.1 \times 10^{-3}$ kg m^2

$k_{11}^A = 110.7$ mm