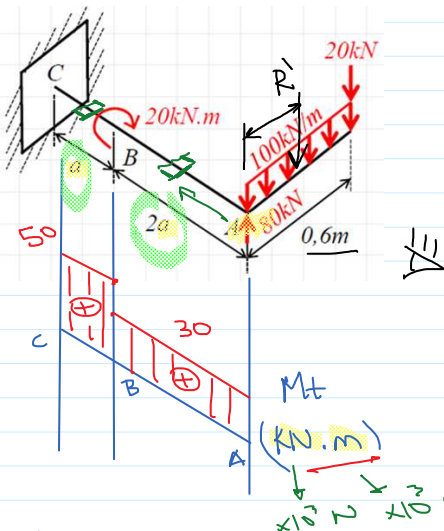
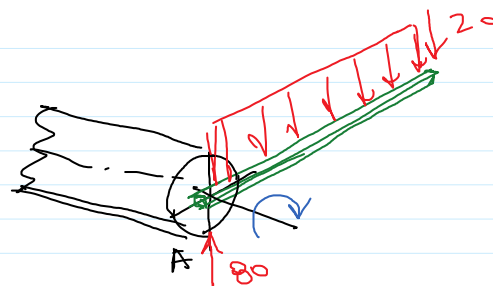
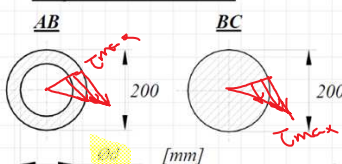


5) A figura abaixo mostra um eixo de alumínio com módulo de elasticidade transversal $G = 27 \text{ GPa}$. Nestas condições, pede-se:

- Diagrama de momento torçor.
- Determinar o diâmetro interno do tubo AB de tal forma que as tensões nos trechos AB e BC sejam iguais.
- O valor da cota a para que o ângulo de torção total do eixo não ultrapasse 2° .



✓ Seções transversais:



↳ Momento Torçor:

$$M_{tAB} = +20 \cdot (0,6) + 100 \cdot (0,6) \cdot (0,3) = +30 \text{ kN.m}$$

$$M_{tBC} = +30 + 20 = +50 \text{ kN.m}$$

b) $d = ?$ considerando $\tau_{\max AB} = \tau_{\max BC}$

$$\frac{M_{tAB}}{I_{PAB}} \cdot R = \frac{M_{tBC}}{I_{PBC}} \cdot R$$

$$\frac{M_{tAB}}{\frac{\pi}{32} \cdot (D^4 - d^4)} \cdot \left(\frac{D}{2}\right) = \frac{M_{tBC}}{\frac{\pi}{32} \cdot D^4} \cdot \left(\frac{D}{2}\right)$$

$$\frac{30 \times 10^6}{\frac{\pi}{32} (200^4 - d^4)} \cdot \left(\frac{200}{2}\right) = \frac{50 \times 10^6}{\frac{\pi}{32} (200)^4} \cdot \left(\frac{200}{2}\right)$$

$$d = 159,05 \text{ mm}$$

↳ Pede-se " a " → condição de r, g, dez

$$\Delta\phi_{A/C} = \Delta\phi_{A/B} + \Delta\phi_{B/C} \leq \bar{\Delta\phi}$$

$$\Delta\phi_{A/C} = \frac{M_{tAB} \cdot 2 \cdot a}{G \cdot I_{PAB}} + \frac{M_{tBC} \cdot a}{G \cdot I_{PBC}} \leq \bar{\Delta\phi}$$

$$\left| \frac{+30 \times 10^6 \cdot 2 \cdot a}{27 \times 10^3 \cdot \frac{\pi}{32} (200^4 - 159,05^4)} + \frac{+50 \times 10^6 \cdot a}{27 \times 10^3 \cdot \frac{\pi}{32} (200)^4} \right| \leq 2^\circ \times \frac{\pi}{180^\circ}$$

$$\left| \frac{27 \times 10^3 \cdot \frac{\pi}{32} (200^4 - 159,05^4)}{27 \times 10^3 \cdot \frac{\pi}{32} (200)^4} \right| = \frac{180^\circ}{180^\circ}$$

$$\therefore a \leq 987,0 \text{ mm}$$