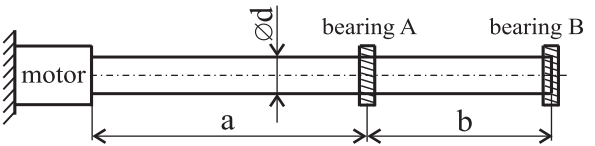
Problem 501

The wattage P is transmitted by the cylindrical homogeneous shaft with the diameter d at the speed of rotation n. The bearings A and B take away the wattage P_A and P_B, respectively. Determine the minimal shaft diameter if the safety factor against the limit state of elasticity must be at least 2 and the twisting angle of the shaft between the motor and the bearing B must not exceed $1,5^o$. Shear yield stress value is $\tau_K = \sigma_K/2$.



Input values:

$a = 1,8\,\mathrm{m}$,	$P_A = 90\,\mathrm{kW}$,	$E = 2 \cdot 10^5\,\mathrm{MPa}$,
$b = 1,2\,\mathrm{m}$,	$P_B = 110\,\mathrm{kW}$,	$\sigma_K = 200\,\mathrm{MPa}$,
$n = 250\,\mathrm{ot/min}$,	$P = 200\,\mathrm{kW}$	$\mu = 0,3$.

torsion