演習問題 6 解答

問題 6.1

$\dfrac{2F}{\pi d^2}$

問題 6.2

比ねじり角 $\dfrac{32T}{\pi G\left(d_A^4 + d_1^4 - d_0^4\right)}$

問題 6.3

5.35 kNm

問題 6.4

(1) $\theta = \dfrac{32TL_A L_B}{\pi\left(G_A a^4 L_B + G_B b^4 L_A\right)}$

(2) $\dfrac{aG_A}{\tau_{yA} L_A} = \dfrac{bG_B}{\tau_{yB} L_B}$

問題 6.5

(1) $\dfrac{16FDL}{G\pi}\left(\dfrac{2}{d_2^4} - \dfrac{1}{d_1^4}\right)$

(2) $\tau_1 = \dfrac{-8FD}{\pi d_1^3}$, $\tau_2 = \dfrac{8FD}{\pi d_2^3}$ 丸棒 I が先に破断する

問題 6.6

(1) $T_C = 2T_0$

(2) $\dfrac{1120 T_0}{\pi d^3 G}$

問題 6.7

理由は各自で考えること

(1) (a), (b), (c)

(2) (c), (a), (b)

(3) (a), (b), (c)

(4) (b), (a), (c)

問題 6.8

(1) 表面において $\tau_I = \dfrac{2T}{\pi a^3}$, $\tau_{II} = 0$ 中心において $\tau_I = 0$, $\tau_{II} = 0$

(2) $\theta_A = \dfrac{32T}{G\pi(2a)^4}16a = \dfrac{32T}{\pi Ga^3}$

(3) $\tau_I = \dfrac{T}{\pi a^3}, \quad \tau_{II} = -\dfrac{T}{\pi a^3}$

(4) $\theta_B = \dfrac{16T}{\pi Ga^3}$

(5) $\tau_I = \dfrac{DG}{32} + \dfrac{T}{\pi a^3}, \quad \tau_I = \dfrac{DG}{32} - \dfrac{T}{\pi a^3}$