

8.19 We are asked to compute the maximum torsional stress amplitude possible at each of several fatigue lifetimes for the brass alloy the fatigue behavior of which is given in Problem 8.18. For each lifetime, first compute the number of cycles, and then read the corresponding fatigue strength from the above plot.

(a) Fatigue lifetime = (1 yr)(365 days/yr)(24 h/day)(60 min/h)(1800 cycles/min) = 9.5×10^8 cycles. The stress amplitude corresponding to this lifetime is about 74 MPa.

(b) Fatigue lifetime = (30 days)(24 h/day)(60 min/h)(1800 cycles/min) = 7.8×10^7 cycles. The stress amplitude corresponding to this lifetime is about 80 MPa.

(c) Fatigue lifetime = (24 h)(60 min/h)(1800 cycles/min) = 2.6×10^6 cycles. The stress amplitude corresponding to this lifetime is about 103 MPa.

(d) Fatigue lifetime = (60 min/h)(1800 cycles/min) = 108,000 cycles. The stress amplitude corresponding to this lifetime is about 145 MPa.