8.21 This problem asks that we determine the maximum lifetimes of continuous driving that are possible at an average rotational velocity of 600 rpm for the alloy the fatigue data of which is provided in Problem 8.20 and at a variety of stress levels.

(a) For a stress level of 450 MPa (65,000 psi), the fatigue lifetime is approximately 18,000 cycles. This translates into $(1.8 \times 10^4$ cycles)(1 min/600 cycles) = 30 min.

(b) For a stress level of 380 MPa (55,000 psi), the fatigue lifetime is approximately 1.5×10^5 cycles. This translates into $(1.5 \times 10^5$ cycles)(1 min/600 cycles) = 250 min = 4.2 h.

(c) For a stress level of 310 MPa (45,000 psi), the fatigue lifetime is approximately 1×10^6 cycles. This translates into $(1 \times 10^6$ cycles)(1 min/600 cycles) = 1667 min = 27.8 h.

(d) For a stress level of 275 MPa (40,000 psi), the fatigue lifetime is essentially infinite since we are below the fatigue limit.