12.18 – Hamrock really should have said "Design the bearing and determine the four things" he asks, because we aren't given enough information to just answer his questions. If we had the clearance and temperature rise, we could compute Bj and do our analysis and be done, but we aren't given them. So we have to go to page 514 and read the fine print a couple of lines above the figure where he says "*The recommended operating eccentricity is midway between these two boundaries*." Knowing that the diameter to width ratio is one, we look where the green curve for $\lambda_j = 1$ crosses the two boundaries. The min friction boundary crosses at an eccentricity of 0.32, and the max load boundary crosses at an eccentricity of 0.54. The average of these eccentricities is 0.86/2 = 0.43. There the Bj is about 0.15. (This is not necessarily the average of the Bj's at the two boundary crossings, 0.09 and 0.2, because of the lin-log chart.)

From this we can get the friction variable $\mu\, r_b/c = 3.8$, the flow variable Q = 4.4, and the leakage ratio = 0.65. This gives a 13.6°C temperature rise, and a mean temperature of about 35° + 7° = 42°C. From Fig. 8.17, this gives a viscosity of about 0.04 PaS. Now go to Eq. 12.84, where we know everything except the clearance c, and rearrange it to solve for c. You should get about 57 microns (10^{-6} meters) for c. Then, Fig. 12.20 shows $H_{min}/c = 0.44$, so $H_{min} = 25$ microns. The min film is located at about 56° from the axis of load application, in the direction of rotation.
The max pressure variable, from Fig. 12.25, is about 0.44 . $p_{max} = 1/0.44 * W_r^* =$ 2.91 MPa. And from Fig. 12.26, the max is located at around 18°.

THE BOOK'S ANSWER IS WAY OFF HERE, AS IS ITS NUMBER FOR q.

Since Q = 4.4, q can be calculated to be 7.83 cm^3/sec. And the side flow is 65% of that, or 5.1 cm^3/sec.

12.21 - Fig. 8.17 gives a viscosity of about 0.12 PaS. Lambda is 2, for which the max load Bj is 0.35. Using Eq. 12.84, we can back out the clearance c = 47.3 microns. From Fig. 12.22, $(R_b/c)\,\mu = 9.5$, so the coefficient of friction is 0.018 . From Fig. 12.23, Q = 5.1, so we can calculate the flow, $q = 1.26 \times 10^{-5}\ m^3$/sec. Fig. 12.24 gives q_s/q as 0.73, meaning that 73% of the flow goes out the sides. The side flow is $0.73 \times q = 9.2 \times 10^{-5}\ m^3$/sec.
The temperature rise comes from Eq. 12.90a. W* is in megapascals, so we divide 10,000 N by (50 mm x 25 mm) = 8 MPa. Then we get delta T =194.8°C. That seems like a lot, huh? To have a mean temperature of 40°C in the oil, the oil would have to be supplied at -57°C, where it is probably difficult to pump. The power loss = $\mu W_r R_b \omega_b$ comes out to 2227 Watts, about three horsepower. That seems like an awful lot, too, but is perhaps consistent with the huge temperature rise.