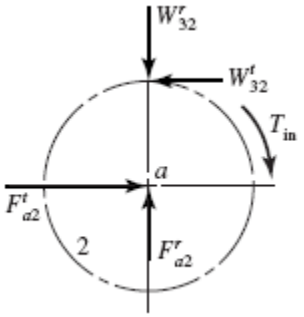
13-40 Given: $P = 5$ teeth/in, $N_2 = 18T$, $N_3 = 45T$,
$\phi_n = 20^\circ$, $H = 32$ hp, $n_2 = 1800$ rev/min

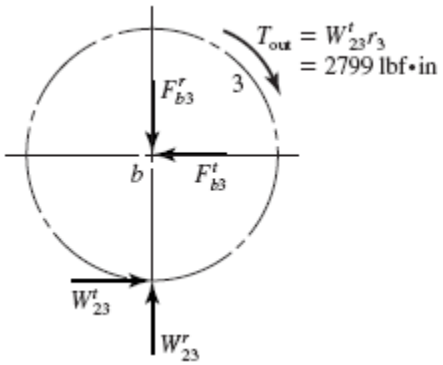
Gear 2



$$T_{in} = \frac{63\,025(32)}{1800} = 1120 \text{ lbf} \cdot \text{in}$$
$$d_P = \frac{18}{5} = 3.600 \text{ in}$$
$$d_G = \frac{45}{5} = 9.000 \text{ in}$$
$$W^t_{32} = \frac{1120}{3.6/2} = 622 \text{ lbf}$$
$$W^r_{32} = 622 \tan 20^\circ = 226 \text{ lbf}$$
$$F^t_{a2} = W^t_{32} = 622 \text{ lbf}, \quad F^r_{a2} = W^r_{32} = 226 \text{ lbf}$$
$$F_{a2} = \left(622^2 + 226^2\right)^{1/2} = 662 \text{ lbf}$$

Each bearing on shaft *a* has the same radial load of $R_A = R_B = 662/2 = 331$ lbf.

Gear 3



$$W^t_{23} = W^t_{32} = 622 \text{ lbf}$$
$$W^r_{23} = W^r_{32} = 226 \text{ lbf}$$
$$F_{b3} = F_{b2} = 662 \text{ lbf}$$
$$R_C = R_D = 662/2 = 331 \text{ lbf}$$

Each bearing on shaft *b* has the same radial load which is equal to the radial load of bearings *A* and *B*. Thus, all four bearings have the same radial load of 331 lbf. *Ans.*