Q1. $\varepsilon = 3$

For a deep groove ball bearing 6304, we have known that:

radial force $F_r = 4\ KN$, *rotational speed* $n = 960\ r/min.$

The load is stable and the working environment is at room temperature.

(a) Please determine the basic rated lifetime of this bearing, and explain the probability of the bearing's lifespan reaching or exceeding this lifespan. 90%

(b) Please determine the basic rated lifetime of this bearing if $F_r = 2\ KN$.

解: (a) $L_h = \frac{10^6}{60n}\left(\frac{C}{P}\right)^{\varepsilon}$ $\therefore P = XF_r + YF_a = F_r = 4000\ N$

for deep groove ball bearing 6204 $\therefore L_h = \frac{10^6}{60\times960} \times \left(\frac{15800}{4000}\right)^3 = 1069.96\ h$ ANS

查表: $C = 15800N$ 由基本额定寿命定义，达到或超过此寿命概率为90% ANS

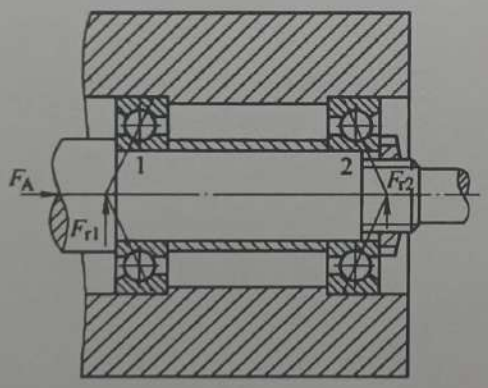
Q2. $\frac{F_a}{F_r} = 0 < e \Rightarrow X=1, Y=0$ (b) $L_h' = \frac{10^6}{60\times960} \times \left(\frac{15800}{2000}\right)^3 = 8559.70\ h$ ANS

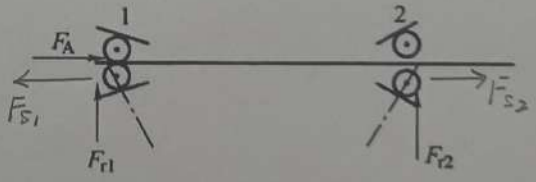
Install a set of angular contact ball bearings on the transmission shaft and arrange them in reverse as shown in the figure. We have known the following information:

$F_{r1} = 1470\ N, F_{r2} = 2650\ N$, *applied axial force* $F_A = 1000\ N$,

journal(轴颈) $d = 40\ mm, n = 5000\ r/min.$

Working environment is at room temperature, with moderate impact and expected lifespan $L_h = 2000\ h$. Please select the model of bearing.





解: 采用试算法 (a)

选用 $\alpha = 25^0$ 的角接触轴承 70000AC

$F_S = 0.68F_r$

$\Rightarrow F_{S1} = 0.68F_{r1} = 0.68\times1470 = 999.6\ N$

$F_{S2} = 0.68F_{r2} = 0.68\times2650 = 1802\ N$

$F_A + F_{S2} = 2802N > F_{S1}$,

$\therefore$ bearing 1 紧, bearing 2 松

$F_{a1} = F_A + F_{S2} = 2802\ N$

$F_{a2} = F_{S2} = 1802N$

(b) Moderate impact: $f_P = 1.5$, room temperature: $f_t = 1$

$\frac{F_{a1}}{F_{r1}} = \frac{2802}{1470} = 1.91 > e = 0.68$, $X_1 = 0.41, Y_1 = 0.87$

$\frac{F_{a2}}{F_{r2}} = \frac{1802}{2650} = 0.68 = e = 0.68$, $X_2 = 1, Y_2 = 0$

$\therefore P_1 = X_1F_{r1} + Y_1F_{a1} = 3040.44N$

$P_2 = X_2F_{r2} + Y_2F_{a2} = 2650N$

choose $P_1 = 3040.44N$

$L_h = \frac{10^6}{60n}\left(\frac{f_tC}{f_PP}\right)^{\varepsilon} \Rightarrow C = \left(\frac{60nL_h}{10^6}\right)^{\frac{1}{\varepsilon}} \cdot \frac{f_P \cdot P}{f_t} = 38466\ N$

查手册，选取角接触轴承7308 AC，其 $C_r = 46200N$，或之