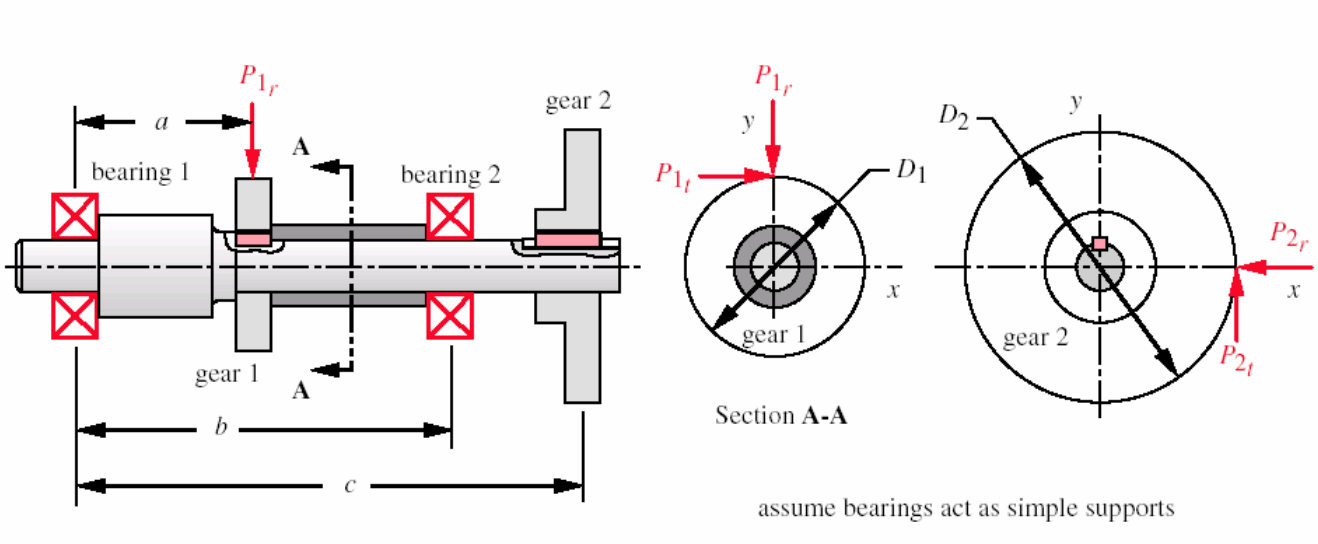
Bearing Selection



a	b	c	P_{1t}	D_1	D_2	L	F_a
10 cm	**20 cm**	**30 cm**	**10000 N**	**15 cm**	**30 cm**	**80 millions of rev**	**4000 N**

Question: Figure shows a shaft supported by two 6300-series bearings. Two gears with equal and opposite torque are keyed to the shaft as shown. The load on each gear consists of a radial and a tangential component. The radial component of each gear is 0.466 times the tangential component on that gear. The gear loads are 90 degrees out of phase from gear 1 to gear 2. For the given data above, select a suitable bearing (from Figure 10-23) for bearing 1.

Solution:

1. Determine the tangential load on gear 2, knowing that the torques on the gears are equal and opposite

$$P_{2t} = \frac{P_{1t} D_1}{D_2} \qquad P_{2t} = \frac{10000 * 15}{30} = 5000\ N$$

2. Determine the radial loads using the given radial load factor

$$P_{1r} = 0.466 * P_{1t} = 4660\ N$$

$$P_{2r} = 0.466 * P_{2t} = 2330\ N$$

3. Determine the bearing reactions in the x-direction by considering the gear loads in the x-z plane only.

$$\sum M = 0 \quad a * P_{1t} + b * R_{2x} - c * P_{2r} = 0$$
$$\sum F = 0 \quad R_{1x} + P_{1t} + R_{2x} - P_{2r} = 0$$

$$R_{2x} = 1165\ N$$
$$R_{1x} = -3495\ N$$

4. Determine the bearing reactions in the y-direction by considering the gear loads in the y-z plane only.

$$\sum M = 0 \quad -a * P_{1r} + b * R_{2y} + c * P_{2t} = 0$$
$$\sum F = 0 \quad R_{1y} - P_{1r} + R_{2y} - P_{2t} = 0$$

$$R_{2y} = -2500\ N$$
$$R_{1y} = 7500\ N$$

5. Calculate the magnitude of the total load at bearing 1.

$$R_1 = \sqrt{R_{1x}{}^2 + R_{1y}{}^2} = 7906\ N$$

6. Calculate the minimum basic dynamic load rating

$$L = \left(\frac{C}{P}\right)^3$$
$$C = R_1 L^{1/3}$$
$$C = 7906 * (80)^{1/3}$$
$$C = 34066\ N = 7659\ lbf$$

From Figure 10-23, we choose bearing number 6309.