

Design a Journal bearing for a Centrifugal Pump with the following data

Diameter of Journal = 150 mm

Load on bearing = 40 kN

Speed of journal = 900 rpm

Soln: Step 1  
→  $L/D$  is 1 to 2

Take,  $L/D = 1.5$

$$L = 1.5 \times 150 = 225 \text{ mm.}$$

Step 2 → Pressure Developed

$$p = \frac{W}{LD} = \frac{40000}{150 \times 225}$$

$$= 1.185 \text{ N/mm}^2$$

Step 3 → Selection of lubricating oil.

Take min value of  $\frac{Zn}{p}$  from PSG DB 7.31 is,

$$\left(\frac{Zn}{p}\right)_{\min} = 2844.5$$

$$Z_{\min} = \frac{2844.5 \times 11.85}{900}$$

$$Z_{\min} = 37.45 \text{ CP} \Rightarrow 40 \text{ CP.}$$

PSGDB at 40 CP and 60°C

SAE 40 oil will be selected.

$$Z = 40.5 \text{ CP.}$$

Step 4  $\rightarrow \mu = \frac{33.25}{10^{10}} \left( \frac{Z\eta}{P} \right) \left( \frac{D}{c} \right) + k$

Co-efficient of friction

$$\therefore D/c = 150 / 150 \times 10^{-3} = 1000.$$

$$k = 0.002.$$

$$\mu = 0.0103$$

Step 5  $\rightarrow H_g = \mu W V$

$$V = \pi D n / 60 = \frac{\pi \times 0.15 \times 900}{60}$$

$$V = 7.068 \text{ m/s}$$

$$H_g = 2912.26 \text{ W}$$

Step 6  $\rightarrow H_d = \frac{(At + 18)^2 LD}{k}$

$$H_d = 174.32 \text{ W}$$

Step 7  $\rightarrow D_b = D + c = D + D/1000$

$$D_b = 150.15 \text{ mm} //$$