

## Section-1

Q-1 Bearing! - It is a machine element which support another moving machine element and permits a relative motion between the contact surface of the members while carrying the load.

Bearing characteristic number =  $ZN/p$

Where  $Z$  - absolute viscosity of lubricant ( $\text{kg/ms}$ )

$N$  - speed of the Journal (rpm)

$p$  - bearing pressure ( $\text{N/mm}^2$ )

[It is a non dimensional number and is used in design of Journal bearing.]

### design procedure for Journal bearing

Step-I Bearing Dimensions! - Calculate the bearing length by choosing a ratio of  $l/d$  from data book.

Step-II Bearing Pressure! - check the bearing pressure,  $P = W/l/d$  from data book, for probable satisfactory value

Step-III Selection of Bearing! - Now, assume a lubrication from



data book and its operating temperature (to). This temperature should be in range of 20-5 °C to 60 °C

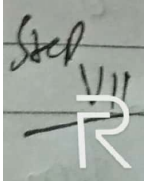
Note - Take 82 °C as a maximum temperature for high temperature installation such as steam turbine

Step-IV Sommerfeld number: Calculate the value of Sommerfeld number (i.e.  $ZN/P$ ) for the assumed bearing temperature and check this value with corresponding value from data book for determining the possibility of maintaining fluid film operation.

Step-V clearance Ratio - Now assume a clearance Ratio (i.e.  $c/d$ ) from data book

Step-VI Coefficient of friction: Calculate the coefficient of friction ( $\mu$ ) by using the relation given below.

$$\mu = \frac{0.326}{10^6} \left( \frac{ZN^3}{P} \right) \left( \frac{d}{c} \right) + 10$$



Heat Generated: Calculate the heat generated ( $Q_g$ ) by using the relation

given below:

$$Q_g = 4 \text{ W}$$

Step-VIII Heat Dissipation: Calculate the heat dissipation ( $Q_d$ )

by using the relation given below:

$$Q_d = CA(t_b - t_a)$$

Step-IX Thermal Equilibrium: At last calculate the thermal equilibrium to see that the dissipated becomes at least equal to the heat generated.