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 member while carring the load.

Bearing characteristic number = ZN/p

Where Z = absolute viscocity of lubricant (kg/mm s)
N = speed of the Journal (rpm)
p = bearing pressure (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, $p = W/ld$ from data book, for probable satisfactory value

Step-III **selection of Bearing**:- Now, assume a lubrication from

data book and its operating temperature (t_o). This temperature should be in range of 26.5°C to 50°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.

Sk-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 (μ) by using the relation given below.

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

Step VII **Heat Generated**:- Calculate the heat generated (Q_g) by using the relation

given below:

$$Q_g = 4WV$$

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.