Registration no: | | | | | | | | | | |

Total Number of Pages: 2 **M.TECH**

MDPC202

2nd Semester M. Tech Regular / Back Examination 2014-15

SUBJECT NAME- Bearings & Lubrication

BRANCH(S):Mechanical Systems Design & Dynamics

Time: 3 Hours

Max marks: 70

Q.CODE:T228

Answer Question No.1 which is compulsory and any five from the rest.

The figures in the right hand margin indicate marks.

Q1 Answer the following questions: (2 x 10)

a) State the important characteristics of viscous flow.

b) Define does viscosity index defines? How it is determined?

c) What is meant by a lightly loaded bearing? What parameters decides whether a bearing is lightly or moderately or heavily loaded?

d) Show that for a full journal bearing the minimum film thickness is a function of bearing clearance and eccentricity.

e) Define Summerfield Number and state its significance.

f) Enumerate the important advantages of hydrostatic sliders over hydrodynamics ones.

g) Which is the ideal location for the inlet hole in a hydrodynamic journal bearing?

h) What is a self-lubricating bearing and how does it function?

i) With examples, discuss the phenomenon of solid lubrication.

j) State the principle by which a shaft rotating at high speed to float in a journal bearing.

Q2 a) The following data is given for a journal bearing : (10)
Radial load of 3.2 kN, Journal speed of 1490 r.p.m, journal diameter of 50 mm, bearing length of 50 mm, radial clearance of 0.05 mm, viscosity of 25 cP. Calculate for the given conditions:

a. Coefficient of friction.
b. Power loss owing to friction.
c. Minimal film thickness
d. Flow requirement of oil in litres /minute
e. Temperature rise in the bearing.

Q3 a) Define viscosity and briefly explain viscosity Index. (5)

b) Briefly describe the mechanism of pressure build-up in a hydrodynamic bearing with relevant figures. (5)

Q4 The following data is given for 360o hydrodynamic journal bearing. (10)

l/d	1
n	1350 r.p.m
Journal diameter	100 mm
Diametral clearance	100 μm
External load	9 kN

The value of minimum film thickness variable is 0.3. Find the viscosity of oil that needs to be used.

Q5 a) Derive the equation for the load bearing capacity, frictional power loss, energy losses of a hydrostatic step bearing. (7)

b) What is air film lubrication? Compare it with oil lubrication. (3)

Q6 a) Explain the working principle of hydrostatic thrust bearing with figures. (5)

b) Derive the equation for pressure acting on hydrostatic annular thrust bearing. (5)

Q7 a) A journal of a stationary oil engine is 80mm in diameter and 40mm long. The radial clearance is 0.060mm. It supports a load of 9kN when the shaft is rotating at 3600 rpm. The bearing is lubricated with SAE 40 oil supplied at atmospheric pressure and average operating temperature is about 65^0C. Using Raimondi-Boyd charts analyze the bearing assuming that it is working under steady state condition. (10)

Q8 Write short notes on any two (5 x 2)

a) Bearing Materials

b) Significance of Stricbeck curve in lubrication

c) Lubrication of Chains

d) Significance of apparent viscosity