**B. Tech. (ME) 7th Semester (G-Scheme)
Examination, November–2023
DESIGN OF MACHINE ELEMENT - II
Paper– PCC-ME-401-G**

Time allowed : 3 hours]   [Maximum marks : 75

Note: Attempt any **Five** Questions in total, at least **one** question from each section. **Question no. 1 is compulsory.** Each question carries equal marks (15 marks).

Note: Use of following Design Data book is permitted:

(i) Design Data Handbook (In SI and Metric Units) for Mechanical Engineers by Mahadevan.

(ii) Design Data Book PSG College of Technology Coimbatore.

1. Explain following:

(a) Function of a lubricant

(b) Law of gearing

(c) Goodman criterion

(d) Value engineering

(e) Torsional rigidity of shaft

(f) Dynamic load for a bearing   6×2.5=15

Section-A

2. (a) Write a short note on stress concentration and stress concentration factor.   7

    (b) Explain different types of fluctuating stresses.8

3. A rotating beam specimen made of steel 45C8 (S_{ut} = 630 N/mm²) is subjected to a completely reversed bending stress. Calculate the endurance strength of the specimen for a life of 90,000 cycles.   15

Section-B

4. What is dynamic loading? Design a shaft for dynamic loading conditions along with the assumptions made.   15

5. A helical compression spring is made of music wire. The spring has to support a load of 150N. Due to space limitations, the outer diameter of the spring should not exceed 25mm, the solid length should not to exceed 40mm and the free length of the spring is not to exceed 100 mm. Allowable shear stress for music wire is 800 MPa and G= 81000 N/mm².   15

Section-C

6. The following data is given for a full hydrodynamic bearing:

Journal speed= 1440 rpm, journal diameter= 60 mm.

Bearing length= 60 mm, radial clearance= 0.06 mm.

Radial load= 3 kN, viscosity of lubricant= 30 cP.

Assume that total heat generated due to friction in bearing is carried by the total lubricant flow. Calculate (a) coefficient of friction, (b) minimum oil thickness, (c) flow requirement, (d) temperature rise and (e) power lost in friction. 15

7. For a single row, deep groove ball bearing, Dynamic load capacity= 5590 N and static load capacity= 2500 N. Actual loads on a bearing are P_a= axial load= 625 N and P_r=radial load = 1250 N. Determine the equivalent load and life of ball bearing if: (a) Inner race is rotating and (b) outer race is rotating. 15

Section-D

8. A pair of straight bevel gears has a velocity ratio of 2: 1. The pitch circle diameter of the pinion is 80mm at the large end of the tooth. A 5 kW power is supplied to the pinion, which rotates at 800 rpm. The face width is 40mm and the pressure angle is 20°. Calculate the tangential, axial and radial components of the resultant tooth force acting on the pinion. 15

9. A pair of helical gears consists of a pinion of 20 teeth and gear of 50 teeth. Helix angle for gears is 15^0 and normal pressure angle is 20^0. If the normal module of gear teeth is 4 mm, Calculate: (a) transverse module, (b) transverse pressure angle, (c) addendum and dedendum circle diameters of both pinion and gear, (d) minimum widths of gears for smooth operation.   15