

band having a width equal to the distance between the bolts. Assume a design stress for spring material as 350 MPa. Determine :

- (i) Thickness of leaves
- (ii) Deflection of spring
- (iii) Diameter of eye
- (iv) Length of leaves
- (v) Radius to which leaves should be initially bent.

Sketch the semi-elliptical leaf-spring arrangement.

The standard thickness of leaves are : 5, 6, 6.5, 7, 7.5, 8, 9, 10, 11 etc. in mm. 10

8. Explain the concept of equalizing the stresses in spring leaves. 10

(Compulsory Question)

9. Short answer type questions : 2×10=20
- (i) Make sketches to show the pressure distribution in a journal bearing with thick film lubrication in axial and along the circumference.
 - (ii) List the important physical characteristics of a good bearing material.

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B. Tech. EXAMINATION, 2022

Semester VI (CBCS)

MACHINE DESIGN-II

ME-603

Time : 3 Hours

Maximum Marks : 60

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt *Five* questions in all, selecting *one* question from each Section A, B, C and D. Q. No. 9 is compulsory. Supplement your answer with suitable sketches wherever required. Assume the data suitably, if required. Use of design data book compiled by PSG College of Engg. & Tech. Coimbatore, India is permitted to be used during the examination. There should not be anything handwritten/corrections in Design Data Book. Each candidate should bring his/her own Design Data Book.

Section A

1. Design a suitable journal bearing for a centrifugal pump from the following available data : Load on the bearing = 13.5 kN; Diameter of the journal = 80 mm; Speed = 1440 r.p.m.; Bearing characteristic number at the working temperature (75°C) = 30; Permissible bearing pressure intensity = 0.7 N/mm² to 1.4 N/mm²; Average atmospheric temperature = 30°C. Calculate the cooling requirements, if any. 10
2. Differentiate between the design procedures applicable for designing boundary versus hydrodynamic lubrication based bearings. 10

Section B

3. A ball bearing subjected to a radial load of 3000 N is expected to have a satisfactory life of 10000 h at 720 rpm with a reliability of 95%. Calculate the dynamic load carrying capacity of the bearing, so that it can be selected from a manufacturer's catalogue based on 90% reliability. If there are four such bearings, each with a reliability of 95% in a system, what is the reliability of the complete system ? 10

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4. Discuss the design procedure applicable for rolling contact bearings. 10

Section C

5. A pair of worm and worm wheel is designated as 2/52/10/4 transmitting 10 kW @ 720 rpm from the worm shaft. The coefficient of friction is 0.04 and the pressure angle is 20°. Calculate the tangential, axial and radial components of the resultant gear tooth force acting on the worm wheel. 10
6. Design a spur gear drive for transmitting 20 kW with a velocity ratio of 1 : 2 and pinion rotates at 400 rpm. Overall system should be accommodated within a space of 0.5 × 0.5 × 0.5 cm³. 10

Section D

7. A semi-elliptical laminated vehicle spring to carry a load of 6000 N is to consist of seven leaves 65 mm wide, two of the leaves extending the full length of the spring. The spring is to be 1.1 m in length and attached to the axle by two U-bolts 80 mm apart. The bolts hold the central portion of the spring so rigidly that they may be considered equivalent to a

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P.T.O.

- (iii) Where are the angular contact and self-aligning ball bearings used ? Draw neat sketches of these bearings.
- (iv) How do you express the life of a bearing ? What is an average or median life ?
- (v) State the two most important reasons for adopting involute curves for a gear tooth profile.
- (vi) Explain the phenomenon of interference in involute gears. What are the conditions to be satisfied in order to avoid interference ?
- (vii) What condition must be satisfied in order that a pair of spur gears may have a constant velocity ratio ?
- (viii) What is nipping in a leaf spring ? Discuss its role.
- (ix) Explain *one* method of avoiding the tendency of a compression spring to buckle.
- (x) The extension springs are in considerably less use than the compression springs. Why ?

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