

7. Select a single row deep groove ball bearing for a radial load of 4000 N and an axial load of 5000 N, operating at a speed of 1600 r.p.m. for an average life of 5 years at 10 hours per day. Assume uniform and steady load. 15

Unit-IV

8. (a) Explain formative or virtual number of teeth on a helical gear. Derive the expression used to obtain its value. 8
- (b) Explain the different causes of gear tooth failures and suggest possible remedies to avoid such failures. 7
9. A pair of straight teeth spur gears is to transmit 20 KW when the pinion rotates at 300 r.p.m. The velocity ratio is 1:3. The allowable static stresses for the pinion and gear materials are 120 MPa and 100 MPa respectively. The pinion has 15 teeth and its face width is 14 times the module. Determine : 15
- Module;
 - Face width; and
 - Pitch circle diameters of both pinion and the gear from the standpoint of strength only, taking into consideration the effect of the dynamic loading.

3607

B.Tech (ME) 7th Semester (G-Scheme)

Examination, December-2022

DESIGN OF MACHINE ELEMENT-II

Paper-PCC-ME-401-G

Time allowed : 3 hours/

[Maximum marks : 75]

Note : Attempt any five questions in all, selecting one question from each unit. Question No. 1 is compulsory. All questions carry equal marks.

Use of following Design Data book is permitted :

(a) Design Data Hand book (In SI and Metric Units) for Mechanical Engineers by Mahadevan (b) Design Data Book PSG College of Technology Coimbatore.

- Discuss the methods of reducing stress concentration. 2.5
 - Discuss the role of processing in design. 2.5
 - Explain the following terms of the spring :
 - Free length ;
 - Spring rate; and
 - Stress factor. 2.5
 - Calculate dynamic viscosity with unit by the help of "Saybolt Universal Second". 2.5
 - List the important physical characteristics of a good bearing material. 2.5
 - Explain the phenomenon of interference in involute gears. 2.5

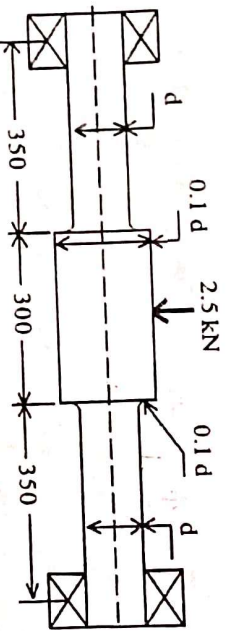
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[P.T.O.]

Unit-I

2. (a) Elaborate fluctuating load, repeated stress, reversed stress. Draw Stress-Time or S-N curve for each. 7
- (b) Discuss the Ergonomic and value engineering considerations in design process. 8

3. A non-rotating shaft supporting a load of 2.5 kN as shown in Fig. the shaft is made of brittle material, with an ultimate tensile strength of 300 N/mm² and the factor of safety is 3. Determine the dimensions of the shaft. 15



Unit-II

4. A shaft supported at the ends in ball bearings carries a straight tooth spur gear at its mid span and is to transmit 7.5 kW at 300 r.p.m. The pitch circle diameter of the gear is 150 mm. The distances between the centre line of bearings and gear are 100 mm each. If the shaft is made of steel and the allowable shear stress is 45 MPa, determine the diameter of the shaft. The pressure angle of the gear may be taken as 20°. 15

5. A helical compression spring made of oil tempered carbon steel, is subjected to a load which varies from 400 N to 1000 N. The spring index is 6 and the design factor of safety is 1.25. If the yield stress in shear is 770 MPa and endurance stress in shear is 350 MPa, Determine : 15
- (1) Size of the spring wire.
 - (2) Diameters of the spring.
 - (3) Number of turns of the spring, and
 - (4) Free length of the spring.

The compression of the spring at the maximum load is 30 mm. The modulus of rigidity for the spring material may be taken as 80 kN/mm².

Unit-III

6. The load on the journal bearing is 150 kN due to turbine shaft of 300 mm diameter running at 1800 r.p.m. Determine the following : 15

- (1) Length of the bearing, and
- (2) Amount of heat to be removed by the lubricant per minute

If the allowable bearing pressure is 1.6 N/mm², bearing temperature is 60° C, viscosity of the oil at 60° C is 0.02 kg/m-s and the bearing clearance is 0.25 mm. 15