

**Section D**

Roll No. ....

Total Pages : 05

7. Explain the following terms of the spring : 15

- (i) Free length
- (ii) Solid height
- (iii) Spring rate
- (iv) Active and inactive coils
- (v) Spring index
- (vi) Stress factor.

8. A helical spring is made from a wire of 6 mm diameter and has outside diameter of 75 mm. If the permissible shear stress is 350 MPa and modulus of rigidity 84 kN/mm<sup>2</sup>, find the axial load which the spring can carry and the deflection per active turn. 15

**(Compulsory Question)**

9. Answer all the following : 1.5×10=15

- (i) Discuss the materials and practical applications for the various types of springs.
- (ii) State the properties of a good lubricant.
- (iii) Explain the backlash in context of gears.
- (iv) Write the Soderberg's equation and state its application to different type of loading.

**J-21-0063**

**B. Tech. EXAMINATION, 2021**

Semester VI (CBCS)

MACHINE DESIGN-II

ME-603

Time : 2 Hours

Maximum Marks : 60

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*The candidates shall limit their answers precisely within 20 pages only (A4 size sheets/assignment sheets), no extra sheet allowed. The candidates should write only on one side of the page and the back side of the page should remain blank. Only blue ball pen is admissible.*

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**Note :** Attempt *Four* questions in all, selecting *one* question from any of the Sections A, B, C and D. Q. No. 9 is compulsory.

**Section A**

1. 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
- (i) Length of the bearing if the allowable bearing pressure is 1.6 N/mm<sup>2</sup>

(ii) Amount of heat to be removed by the lubricant per minute if the bearing temperature is 60°C and viscosity of the oil at 60°C is 0.02 kg/m-s and the bearing clearance is 0.25 mm.

2. (a) List the importance physical characteristics of a good bearing material. What are the commonly used materials for sliding contact bearings ? 7.5
- (b) List the basic assumptions used in the theory of hydrodynamic lubrication. Explain wedge film and squeeze film journal bearings. 7.5

### Section B

3. A shaft rotating at constant speed is subjected to a variable load. The bearings supporting the shaft are subjected to stationary equivalent radial load of 3 kN for 10 per cent of time, 2 kN for 20 per cent of time, 1 kN for 30 per cent of time and no load for remaining time of cycle. If the total life expected for the bearing is  $20 \times 10^6$  revolutions at 95 per cent reliability, calculate dynamic load rating of the ball bearing. 15
4. How do you express the life of bearing ? What is an average and medium life ? Establish the relation between bearing life and reliability of bearing. 15

### Section C

5. (a) Explain the phenomenon of interference in involute gears. What are the conditions to be satisfied in order to avoid interference ? 7.5
- (b) Explain the different causes of gear tooth failures and suggest possible remedies to avoid such failures. 7.5
6. The following particulars of a single reduction spur gear are given : 15
- Gear ratio = 10 : 1; Distance between centres = 660 mm approximately; Pinion transmits 500 kW at 1800 r.p.m.; Involute teeth of standard proportions (addendum = m) with pressure angle of 22.5°; Permissible normal pressure between teeth = 175 N per mm of width.
- Find :
- (i) The nearest standard module if no interference is to occur
- (ii) The number of teeth on each wheel
- (iii) The necessary width of the pinion
- (iv) The load on the bearings of the wheels due to power transmitted.

- (v) What is meant by 'stress concentration' ?
- (vi) What is meant by hydrodynamic lubrication ?
- (vii) Write the terms (a) bearing characteristic number; (b) bearing modulus.
- (viii) Explain the terms in journal bearing (a) wedge film; (b) squeeze film.
- (ix) What is herringbone gear ? Where are they used ?
- (x) What are the various forces acting on worm and worm gears ?