

Total No. of Questions - 9] [Total No. of Printed Pages - 4]

Dec-25-0232

ME-603 (Machine Design-II)

B.Tech. 6th (CBCS)

Max. Marks : 60

Time : 3 Hours

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, select one question each from section A, B, C & D. Section E (question 9) is compulsory.

SECTION - A

1. Answer all the questions.
  - a. What are journal bearings? Give a classification of these bearings.
  - b. List the assumptions used in the theory of hydrodynamic lubrication.
  - c. What are the Reynold's assumptions for the formation of thick oil film in hydrodynamic lubricated bearings?
  - d. Explain wedge film and squeeze film journal bearing. (4×2½=10)

OR

2. Answer all the questions.
  - a. What are the terms used in journal bearings analysis and design? Give their definition in brief.
  - b. What are the materials used for sliding contact bearing?
  - c. Explain the design procedure of journal bearing.
  - d. Define thrust bearing and describe in detail footstep bearing. (4×2½=10)

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SECTION - B

3. Select a single row deep groove ball bearing for a radial load of 4000N and an axial load of 5000N, 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. (10)

OR

4. The rolling contact ball bearing are to be selected to support the overhung countershaft. The shaft speed is 720.r.p.m. The bearings are to have 90% reliability corresponding to a life of 24000hours. The bearing is subjected to an equivalent radial load of 1 KN. Consider life adjustment factors for operating condition and material as 0.9 and 0.85 respectively. Find the basic dynamic load rating of the bearing from manufacturer's catalogue, specified at 85% reliability. (10)

SECTION - C

5. A pair of cast iron bevel gears connect two shafts at right angles. The pitch diameters of the pinion and gear are 80 mm and 100 mm respectively. The tooth profiles of the gears are of 14 1/2° composite form. The allowable static stress for both the gears is 55 MPa. If the pinion transmits 2.75 kW at 1100 r.p.m., Design the bevel gear and check the design from the standpoint of dynamic and wear load. Take surface endurance limit as 630 MPa and modulus of elasticity for cast iron as 84 KN/mm<sup>2</sup>. (10)

OR

6. A bronze spur pinion rotating at 600r.p.m. drives a cast iron spur gear at a transmission ratio 4:1. The allowable static stresses for the bronze pinion and cast-iron gear are 84 MPa and 105 MPa respectively. The pinion has 16 standards 20° full depth involute teeth of module 8mm. The face width of both the gears is 90mm. Find the power that can be transmitted from the standpoint of strength. (10)

[P.T.O.]

## SECTION - D

7. Design a helical compression spring for a maximum load of 1000N for a deflection of 25mm using the value of spring index as 5. The maximum permissible shear stress for spring wire is 480 MPa and modulus of rigidity is 84 KN/mm<sup>2</sup>.

Take Wahl's factor,  $K = \frac{4C-1}{4C-4} + \frac{0.615}{C}$ , where C is spring index. (10)

OR

8. The following data is given for a four-stroke diesel engine: Cylinder bore = 250 mm; Length of stroke = 300 mm; Speed = 600 rpm; Indicated mean effective pressure = 0.6 MPa; Maximum gas pressure = 4 MPa; Fuel consumption = 0.25 kg per BP per h; Higher calorific value of fuel = 44 000 kJ/kg. The piston is made of grey cast iron FG 200 (Sut = 200 N/mm<sup>2</sup> and k = 46.6 W/m<sup>2</sup>°C) and the factor of safety is 5. The temperature difference between the centre and the edge of the piston head is 220°C. Determine (i) Thickness of cylinder head and (ii) Ribs & cup are required or not? If yes, find radius of cup. (10)

## SECTION - E (Compulsory)

9. Answer all the questions (Short note).
- Bearing characteristic number.
  - Bearing modulus.
  - Life of bearing.
  - Static equivalent load.
  - Roller contact bearing.
  - Design procedure of spur gear.

- Causes of gear tooth failure.
- Phenomenon of interference in involute gears.
- Compression and fluctuating loads.
- Design of crank hook. (10×2=20)