

Code No.: ME601PC

R20 H.T.No.

8 R

CMR ENGINEERING COLLEGE: : HYDERABAD
UGC AUTONOMOUS
III-B.TECH-II-Semester End Examinations (Regular) - May- 2023
DESIGN OF MACHINE MEMBERS - II
(MECH)

[Time: 3 Hours]

[Max. Marks: 70]

Note: This question paper contains two parts A and B.

Part A is compulsory which carries 20 marks. Answer all questions in Part A.

Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART-A

(20 Marks)

1. a) Explain the importance of bearing modulus while designing the bearing? [2M]
- b) Mention the difference between full and partial journal bearing? [2M]
- c) Classify different types of rolling contact bearings. [2M]
- d) Define static load and mention its effect on the bearing. [2M]
- e) What are the functions of a piston? [2M]
- f) What are the forces acting on connecting rod? [2M]
- g) Classify different types of springs? [2M]
- h) What are the advantages of V-belts over flat belt? [2M]
- i) State the applications of gears. [2M]
- j) Mention the advantages of gears over other drives. [2M]

PART-B

(50 Marks)

- 2.a) Explain briefly about bearing materials. [4M]
- b) The following data is given for hydrostatic thrust bearing: thrust load = 500N, shaft speed = 720 rpm, ratio of recess radius to shaft radius = 0.6, viscosity of lubricant = 160 SUS, specific gravity = 0.86. Calculate: radius of shaft and recess, supply pressure. [6M]

OR

- 3.a) Explain the procedure to design a journal bearing. [5M]
 - b) The following data is given for full hydrodynamic bearing: radial load = 1200 N, journal speed = 1440 rpm, journal diameter = 50 mm, static load on journal bearing = 350 N, the values of surface roughness of journal and bearing is 2 and 1. The minimum oil thickness should be 05 times the sum of surface roughness of journal and bearing. Calculate: radial clearance, minimum oil film thickness, viscosity of lubricant. [5M]
- 4.a) Explain about equivalent bearing load and how it is calculated. [4M]
 - b) The radial load acting on the ball bearing is 5kN and the expected life for 90% of bearing is 8000 hr. calculate the dynamic load carrying capacity when the shaft rotates at 1500 rpm. [6M]

OR

- 5.a) Discuss briefly about load-life relationship in roller bearings. [4M]
- b) A taper roller bearing has a dynamic load capacity of 26 kN. The desired life for 90% of bearings is 8000 hours and the speed is 300 rpm. Calculate the equivalent radial load that the bearing can carry. [6M]

252
64
132
127
1/5

6. Following data is given for the piston of four stroke diesel engine: cylinder bore = 250 mm, piston rings are made of grey cast iron, allowable tensile stress = 100 N/mm^2 , allowable radial pressure on cylinder walls = 0.03 Mpa, thickness of piston head = 42 mm, number of piston rings = 4. Calculate: radial width of piston rings, axial thickness of piston rings, gap between the free ends of the piston before assembly, width of top land, width of the ring grooves, and thickness of piston barrel. [10M]

OR

7. Determine the dimensions of cross section of connecting rod for the following data: cylinder bore = 100 mm, length of connecting rod = 350 mm, maximum gas pressure = 4 Mpa, factor of safety = 6 [10M]

8.a) Define: Free length, Compressed length, and Solid Length of helical spring with neat sketch. [6M]

b) Mention the difference between compression helical spring and extension helical spring. [4M]

OR

9.a) What are the desirable properties for belt materials? [5M]

b) Discuss about different types of stresses in wire ropes. [5M]

10. It is required to design a pair of spur gears with 20° full-depth involute teeth based on the Lewis equation. The velocity factor is to be used to account for dynamic load. The pinion shaft is connected to a 10 kW, 1440 rpm motor. The starting torque of the motor is 150% of the rated torque. The speed reduction is 4 : 1. The pinion as well as the gear is made of plain carbon steel 40C8 ($S_{ut} = 600 \text{ N/mm}^2$). The factor of safety can be taken as 1.5. Design the gears, specify their dimensions and suggest suitable surface hardness for the gears. [10M]

OR

11. A pair of spur gears with 20° full-depth involute teeth consists of a 20 teeth pinion meshing with a 41 teeth gear. The module is 3 mm while the face width is 40 mm. The material for pinion as well as gear is steel with an ultimate tensile strength of 600 N/mm^2 . The gears are heat treated to a surface hardness of 400 BHN. The pinion rotates at 1450 rpm and the service factor for the application is 1.75. Assume that velocity factor accounts for the dynamic load and the factor of safety is 1.5. Determine the rated power that the gears can transmit. [10M]
