

Code: **MEMD1T6B**

**I M.Tech - I Semester – Regular/Supplementary Examinations –  
January - 2017**

**GEAR ENGINEERING  
(MACHINE DESIGN)**

Duration: 3 hours

Max. Marks: 70

Answer any FIVE questions. All questions carry equal marks

1. a) What is backlash in gear teeth? What factors influence the backlash in gear teeth? 7 M
  
- b) What are different standard systems for the shape of gear teeth? Explain them. 7 M
  
2. a) What is meant by equivalent spur gear? 4 M
  
- b) Design a spur gear drive to transmit 22kW at 900rpm, speed reduction is 2.5m materials for pinion and wheel are C15 steel and cast iron grade 300 respectively. Take pressure angle of  $20^\circ$  and working life of the spur gears as 10,000 hrs. 10 M
  
3. A pair of helical gears have  $20^\circ$  stub teeth in diameters plane and helix angle is  $45^\circ$ . The power to be transmitted is 20kW. The pinion rotates at 5000rpm and has 30teeth.The

gear ratio is 5. The material for gears is steel with safe bending stress of 110MPa. Design A helical gear system with suitable assumed data. 14 M

4. a) Explain the tooth loads in bevel gears and their significance in the selection of bearing and design of shaft. 6 M

b) Face width is  $\frac{1}{3}^{\text{rd}}$  of slant length. Velocity factor is  $\frac{3}{3+v}$ . Find modulate, face width, pinion chic, gear die. Check the design for dynamic load and wear.  $C = 300\text{kN/m}$ . If the mean plan of the gear is 120mm from the left hand bearing, determine the forces on the bearings and estimate the diameter of the shaft. 8 M

5. a) Why is the center distance an important parameter in the design of worm and worm gear? 6 M

b) A worm drive transmits 15kW at 2000rpm to a machine carriage at 75rpm. The worm is triple threaded and has 65mm pitch diameter. The worm gear has 90 teeth of 6mm module. The tooth form is to be  $20^\circ$  full depth involute. The coefficient of friction between the rating teeth may be taken as 0.1 calculate: 8 M

- i) Tangential force acting on the worm.
- ii) Axial thrust and separating force on worm
- iii) Efficiency of the worm drive.

6. a) What are the different types of problems faced while using gears? Explain them briefly. 7 M
- b) What is Gear noise? How it effects the gear system? 7 M
7. a) Describe the function of a pre-selective gear box of an automobile. 7 M
- b) Explain the procedure to analyse an epicyclic gear train. 7 M
8. a) What are the applications of traditional and non traditional optimization techniques. 7 M
- b) Formulate the gear train problem in which number of teeth of gear are assumed to be known and face width of gears are assumed as decision variables. Take minimization of total weight of gear train as objective. 7 M