

Code: ME6T2

**III B.Tech-II Semester–Regular/Supplementary Examinations–March 2019**

**DESIGN OF MACHINE MEMBERS-II  
(MECHANICAL ENGINEERING)**

**Note : Use of approved Design Data Books are Permitted**  
Assume any data if necessary and state it appropriately.

Duration: 3 hours

Max. Marks: 70

**PART – A**

Answer *all* the questions. All questions carry equal marks

11x 2 = 22 M

1. a) How will you design shaft as per ASME code ?
- b) What is feather key ? Give its applications.
- c) Write the differences between protected and unprotected rigid flange couplings.
- d) Draw a sketch showing the pressure distribution around the periphery of a hydrodynamic journal bearing.
- e) Define the terms of Rated life and Dynamic load carrying capacity.
- f) What are the advantages of V-belts over flat-belts ?
- g) What are Simple and Duplex roller chains?
- h) What are the types of stresses induced in Wire ropes ?
- i) How will you designate square and trapezoidal threads ?
- j) What is dynamic tooth load ? What are its causes ?
- k) Write down the expressions for three components of resultant tooth force in helical gears.

## PART – B

Answer any *THREE* questions. All questions carry equal marks.

3 x 16 = 48 M

2. a) A propeller shaft is required to transmit 50 kW power at 600 rpm. It is a hollow shaft, having inside diameter 0.8 times of the outside diameter. It is made of steel ( $S_{yt} = 380 \text{ N/mm}^2$ ) and the factor of safety is 4. Design the inside and outside diameters of the shaft. Assume ( $S_{sy} = 0.5 S_{yt}$ ) 6 M

b) A protective flange coupling is used to connect two shafts and transmit 7.5 kW power at 720 rpm. The design torque is 150 % of the rated torque. The shafts and bolts are made of plain carbon steel 30C8 ( $S_{yt} = 400 \text{ N/mm}^2$ ) and the factor of safety is 5. Assume  $S_{yc} = 1.5 S_{yt}$  and  $S_{sy} = 0.5 S_{yt}$ . The flanges are made of cast iron. Calculate: (i) diameter of the shafts (ii) number of bolts and (iii) diameter of bolts. 10 M

3. a) Following data is given for a  $360^\circ$  hydrodynamic bearing:

Journal diameter = 100 mm

Bearing length = 100 mm

Radial load = 50 kN

Journal speed = 1440 rpm

Radial clearance = 0.12 mm

Viscosity of lubricant = 16 Cp

Calculate : (i) Minimum film thickness and (ii) Coefficient of friction and (iii) Power lost in friction. 8 M

b) A single row deep groove ball bearing No.6002 is subjected to an axial thrust of 1000 N and a radial load of 2200 N. Find the expected life that 50 % of the bearings will complete under this condition. 8 M

4. a) What are the advantages of Chain drives ? 4 M

b) Select a suitable V-belt drive to connect a 20 kW,1440 rpm motor to a compressor running at 480 rpm for 15 hr per day. The space available for centre distance of approximately 1200 mm. Determine: (i) the specifications of the belt (ii) diameters of motor and compressor pulleys (iii) the correct centre distance and (iv) the number of belts. 12 M

5. a) Explain the construction of 6X19 wire ropes . 6 M

b) A double threaded power screw, with ISO metric trapezoidal threads ,is used to raise a load of 300 kN. The nominal diameter is 100 mm and the pitch is 12 mm. The coefficient of friction at screw threads is 0.15. Neglecting collar friction, Calculate: (i) torque required to raise the load (ii) torque required to lower the load and (iii) efficiency of the screw. 10 M

6. a) Explain briefly about the gear tooth failures. 6 M

b) A pair of spur gears with  $20^\circ$  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 the pinion as well as for the gear is steel with an ultimate tensile strength of  $600 \text{ N/mm}^2$ . 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.

10 M