

Subject code: - TME-603

Roll No. to be filled in your Answer Book

Roll No.

--	--	--	--	--	--	--	--	--	--

PAPER ID-

**B.Tech.**

**Mechanical Engineering,(VI Sem.)**

**Machine Design-II (TME-603)**

Time- 3 Hours

Max marks: 100

**NOTE:**

- i. All questions are compulsory.
- ii. Draw diagrams wherever necessary.
- iii. All questions carry equal marks. .

1. Attempt any **FOUR** parts of the following. 5 X 4

- (A) What are the steps involved in the design of a machine element?
- (B) What are the advantages of involute teeth gears?
- (C) What kind of contact occurs between worm and worm wheel? How does it differ from other types of gears?
- (D) Explain the forces acting on the bevel gear tooth.
- (E) Describe the types of ball bearings with the help of neat and clean sketch.
- (F) Discuss in brief general design considerations for an IC engine parts.

2. Write short note on any **four** parts 5 X 4

- (A) Thrust ball bearing
- (B) Importance of heat dissipation in worm and worm gear
- (C) Failure of gear tooth and their causes
- (D) Bearing Life
- (E) Efficiency of worm gears
- (F) Hydrodynamic theory of lubrication

3. Attempt any **TWO** parts of the following

10X2

- (A) What is meant by bearing characteristics number? What is its significance? Discuss the variation of co-efficient of friction with bearing characteristics number.
- (B) A ball bearing is operating on a work cycle consisting of three parts a radial load of 3000 N at 1440 rpm for one quarter cycle, a radial load of 5000 N at 720 rpm for one half cycle, and radial load of 2500 N at 1440 rpm for the remaining cycle. The expected life of the bearing is 10 000 h. Calculate the dynamic load carrying capacity of the bearing.
- (C) 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 pinion as well as gear is steel with an ultimate tensile strength of 600 N/mm<sup>2</sup>. 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.

4. Attempt any **TWO** parts of the following

10X2

- (A) Discuss various types of lubrication in case of journal bearings. Also describe some metallic and non-metallic bearing materials.
- (B) The following data is given for a  $360^\circ$  hydrodynamic bearing:  
 Radial load = 3.2 kN, journal speed = 1490 rpm, journal diameter = 50 mm, bearing length = 50 mm, radial clearance = 0.05 mm and viscosity of lubricant = 25 cP  
 Assuming that the total heat generated in the bearing is carried by the total oil flow in the bearing, calculate  
 (i) Coefficient of friction;  
 (ii) Power lost in friction;  
 (iii) Minimum oil film thickness;  
 (iv) Flow requirement in litres/min; and  
 (v) Temperature rise.

(C) With the help of neat and clean sketch describe the terminology of worm gear.

5. Attempt any **TWO** parts of the following

10 X 2

(A) With the help of neat and clean sketch explain terminology of helical gears.

(B) A pair of worm gears is designated as, 1/30/10/8

Calculate

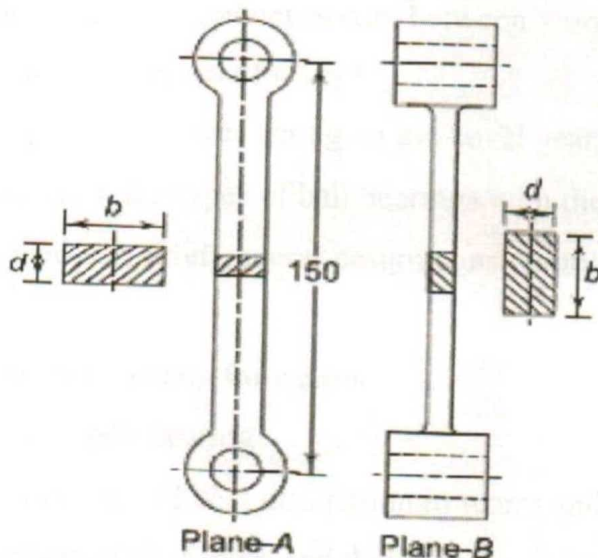
(i) The centre distance;

(ii) The speed reduction;

(iii) The dimensions of the worm; and

(iv) The dimensions of the worm wheel

(C) A piston rod of rectangular crosssection, with both ends hinged, is shown in Fig. below. It is made of steel 40C8 ( $S_{yt} = 380 \text{ N/mm}^2$  and  $E = 207\,000 \text{ N/mm}^2$ ) and subjected to an axial compressive force of 15 kN. Determine the ratio of  $(b/d)$  for equal buckling strength in either plane. Also determine the dimensions of cross-section, if the factor of safety is 4.



\*\*\*\*\*