

Paper ID : 140612

Roll No.

**B. TECH.**

**Theory Examination (Semester-VI) 2015-16**

**MACHINE DESIGN-II**

**Time : 3 Hours**

**Max. Marks : 100**

- Note :**
1. Assume any missing data suitably.
  2. Use of design data book is allowed.

**Section-A**

1. **Attempt all question :** (2 × 10 = 20)
- (a) 20-tooth, 8 pitch, 2.54-mm-wide, 20° pinion transmits 5 kw at 1725 rpm to a 60-tooth gear. Determine driving force, separating force, and resultant force that would act on mounting shafts.
  - (b) What do you understand by beam strength of gear tooth?
  - (c) Define worm gearing with applications?
  - (d) Classify the sliding contact bearing in terms of thickness of layer of the lubricant between the bearing and journal?

(1)

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(g) What is herringbone helical gear?

**Section-B**

2. Attempt any five questions.

(5×10=50)

- (a) A pair of straight teeth spur gears is to transmit 25 kW when pinion rotates at 300 rpm. The velocity ratio is 1 : 3. The allowable static stresses for the pinion and gear materials are 120 Mpa and 100 Mpa respectively. The pinion has 15 teeth and its face width is 15 times the module. Determine the module, face width and pitch circle diameters of both the pinion and the gear from standpoint of strength only, taking into consideration the effect of dynamic loading. Assume 20° full depth involute pairs with ordinary cutting.
- (b) A steel pinion with 20° full depth involute teeth is transmitting 7.5 kW power at 1000 rpm from an electric

(c) A pair of 20° stub teeth spur gears is to transmit 20 kW. The pinion rotates at 500 rpm and the V.R. is 1 : 4. The allowable static stress for gear and pinion are 100 Mpa and 120 Mpa respectively. The pinion has 20 teeth and face width is 10 times the module. Design the gear for static strength

- (d) Give the terminology of helical gears with suitable diagram. Also explain the forces on a helical gear tooth.
- (e) A journal bearing has a journal diameter of 50 mm and the diameter of bushing is 50.1 mm. The bushing is 50 mm long and has to support a load of 1 kN at a speed of 1200 rpm. Determine the minimum oil film thickness and power loss for SAE 10 oil, assuming the oil film temperature to be 70°C.
- (f) A pair of helical gears is used to transmit 15 kW at 3000 rpm of the pinion. The teeth are 20° stub in

(2)

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is 150 mm. The maximum gas pressure inside the cylinder is limited to 3.5 Mpa. The cylinder head is made of grey cast iron FG 200 (cut = 200 N/mm<sup>2</sup>) and the FOS is 5. Determine the thickness of the cylinder head. Studs is made of steel FeE 250 ( $\sigma_{yt}$  = 250 N/mm<sup>2</sup>) and the FOS is 5. Calculate :

- (i) Number of studs
- (ii) Nominal diameter of studs
- (iii) Pitch of studs

Determine the dimensions of cross-sections of the connecting rod (1-section), for a diesel engine with the following data :

- (i) Cylinder bore = 100 mm
- (ii) Length of connecting rod = 320 mm

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Power transmitted = 20 kW,  $n_p$  = 720 rpm,  $z_p$  = 35,  $z_g$  = 70, centre distance = 285 mm, normal module = 5 mm,  $b$  = 50 mm, normal pressure angle = 20°,  $S_w$  = 600 N/mm<sup>2</sup>, surface hardness number = 300 BHN, grade of machining = 6, Service factor = 1.25 Calculate :

- (i) The helix angle;
- (ii) Beam strength,
- (iii) Wear strength,
- (iv) Static load
- (v) The dynamic load by Buckingham's equation.
- (vi) Effective factor of safety against bending failure.

4. Design a high efficiency worm gear speed reducer to transmit continuously the rated power output of 15 kW motor running

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at 1750 rpm. The steel gear having hardness 250 BHN is integral with the motor shaft. The speed ratio is 10, while the phosphor bronze gear should not have less than 40 mm.

5. Answer following in brief.

- (i) Virtual no. of teeth in helical gear.
- (ii) Hydrostatic versus hydrodynamic bearing.
- (iii) Reliability of antifriction bearings.

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