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Roll No .....

**ME-802****B.E. VIII Semester**

Examination, June 2017

**Machine Design****Time : Three Hours****Maximum Marks : 70**

- Note:** i) Attempt any five questions out of eight.  
 ii) All questions carry equal marks.  
 iii) Use of PSG and Mahadevan and Reddy Design Data book is permitted in the exams.  
 iv) Assume suitable missing/misprint data, if any

- I. a) What are the advantages and disadvantages of flat belt drive?  
 b) Discuss the construction of wire ropes with the help of a neat sketch.
2. A leather belt of 10×250 mm section is used to drive a cast iron (follower) pulley of 500 mm in diameter at 360 rpm. The angle of contact on the smaller (driver) pulley is 140°. The permissible stress for the belt material is 2N/mm<sup>2</sup>. The mass density of leather is 1000 kg/m<sup>3</sup> and coefficient of friction between the belt and pulley is 0.30. Determine the power capacity of the drive.
3. a) What are the advantages of cycloidal teeth gears and involute teeth gear?  
 b) What is the difference between double and herringbone helical gears? State advantages these gears also.

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4. A pair of parallel helical gears consists of an 18 teeth pinion meshing with a 45 teeth gear. 7.5 kW power at 2000 rpm is applied to the pinion through its shaft. The normal module is 6 mm while the normal pressure angle is 20°. The helix angle is 23°. Determine the tangential, radial and axial components of the resultant tooth force between the meshing teeth. Draw also free body diagram of forces.
5. The base of a cylinder of the four stroke diesel engine is 150mm. The maximum gas pressure inside the cylinder is limited to 3.5 MPa. The cylinder head is made of grey cast iron FG 200 ( $S_{ut} = 200 \text{ N/mm}^2$ ) and the factor of safety is 5. Determine the thickness of cylinder head. Studs are used to fix the cylinder head to the cylinder and obtain a leakproof joint. They are made of steel FeE250 ( $S_{yt} = 250 \text{ N/mm}^2$ ) and factor of safety is 5. Calculate the following (i) number of studs (ii) nominal dia and pitch of studs.
6. A mild steel shaft has to transmit 70 kW at 240 rpm. The allowable shear stress is limited to 45 MPa and the angle of twist is not to exceed 1° in a length of 20 times the shaft diameter. Determine the shaft diameter and design a cast iron flange coupling of protected type for the shaft. The shear stress in the coupling bolts is to be limited to 30 MPa.
7. a) What is optimization? Discuss different optimization techniques.  
 b) Discuss the Lagrange-multiplier method of optimization.
8. Write short notes on any two:
  - i) Design of chain drive
  - ii) Design of bevel gear
  - iii) Design of pressure vessel

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