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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD
B. Tech III Year II Semester Examinations, June - 2014
DESIGN OF MACHINE MEMBERS-II
(Mechanical Engineering)

Time: 3 hours   Max. Marks: 75

Answer any five questions
All questions carry equal marks

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1.a) What is boundary lubrication? Differentiate between hydrostatic and hydro dynamic lubrication?

   b) Design a journal bearing for a centrifugal pump running at 1440 rpm, diameter of journal is 10cm and the load on each bearing is 2000 kg. The factor ZN/P may be taken as 2800 for centrifugal pump bearings.

2.a) Why are ball and roller bearings described as anti-friction bearings.

   b) A ball bearing is subjected to radial forces of 2500 N and an axial force of 1000N. The dynamic load carrying capacity of the bearig is 7350 N. The values of X and Y factors are 0.56 and 1.6 respectively. The shaft is rotating 720 rpm. Determine the life of bearing.

3. Design a trunk type cast iron piston for an I.C. engine from the given data: Diameter of the cylinder is 100 mm, stroke 120 mm, maximum explosion pressure is 40 kg/cm^2, maximum permissible tension for cast iron for the design of head thickness is 300 kg/cm^2, and the flexural stress for the pin may be taken from 900 to1200 kg /cm^2.The gudgeon pin should be hardened and ground and should turn in phosphor bronze bushing. Bearing pressure should be limited to 200 kg /cm^2.sketch the piston inserting important dimensions of the piston with piston pin, piston rings and scraper ring in position.

4. A simple chain No.10B is used to transmit power from a 1400 rpm electric motor to a line shaft running at 350 rpm. The number of teeth on the driving sprocket wheel is 19. The operation is smooth without any shocks. Calculate:
   i) The rated power for which the chain drives can be recommended;
   ii) The tension in the chain for this rated power; and
   iii) The factor of safety for the chain based on the breaking load.

5. A pair of spur gears with a 20° pressure angle, consist of a 25 teeth pinion meshing with a 60 teeth gear. The module is 5 mm, while the face width is 45 mm. The pinion rotates at 500 rpm. The gears are made of steel and heat treated to a surface hardness of 220 BHN. Assume that dynamic load is accounted by means of the velocity factor. The service factor of safety is 1.75 and 2 respectively.
   Calculate:
   i) Wear strength of gears;
   ii) The static load that the gears can transmit without pitting; and
   iii) Rated power that can be transmitted by gears.

6. A herringbone speed reducer consists of a 26-teeth pinion driving a 104 teeth gear. The gears have a normal module of 2 mm. The pressure angle is 25°. The pinion receives 100 kW power through its shaft and rotates at 3600 rpm. The face width of each half is 35 mm. The gears are made of alloy steel 30NiCrl (s_{ut} = 1500 N/ mm^2) and heat treated to surface hardness of 40BHN. The surface factor is 1.25. Determine the factor of safety against bending failure and against pitting failure.

7.a) Explain the force diagram for Trapezoidal thread and derive its equation.
  b) Explain the design procedure of power screws.

8.a) Explain the mode of failure in worm gearing?
  b) How the coefficients of friction vary in worm gearing with change in rubbing velocity? Explain.

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