Code :R7310305

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III B.Tech I Semester(R07) Supplementary Examinations, May 2011
DESIGN OF MACHINE MEMBERS-I
(Mechanical Engineering)

Time: 3 hours

Max Marks: 80

Answer any FIVE questions
All questions carry equal marks
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1. (a) Enumerate various factors influencing selection of materials.
   (b) A cast iron pulley transmits 20Kw at 300RPM. The diameter of pulley is 0.55 metre of elliptical cross section in which major axis is twice minor axis, find dimensions of arm if the allowable bending stress is 15 MPa.

2. (a) Explain fatigue stress concentration factor and notch sensitivity.
   (b) Determine the size of a piston rod subjected to fluctuation of loads from 15KN (compression) to 25KN (tension). The endurance limit is 360MPa and yield strength is 400MPa. Take the impact factor =1.25. Factor of safety=1.5. Surface factor=0.88. Stress concentration factor =2.25.

3. (a) Explain caulking and fullering.
   (b) Two plates of mild steel tie rod are connected with width 200 mm and thickness 12.5mm are to be connected by means of a butt joint with double cover plates. Design the joints if safe stresses are 80MPa in tension; 65MPa in shear ; and 160MPa in crushing. Make sketch of a joint.

4. (a) Describe bolts of uniform strength.
   (b) The cylinder head of a steam engine is subjected to a steam pressure of $1N/mm^2$. If is held in position by means of 12 bolts. A soft copper gasket is used to make the joint leak proof. The effective diameter of cylinder is 300mm. Find the size of bolts, so that the stress in the bolts is not to exceed 100MPa.

5. (a) Discuss the effect of keyway on a shaft.
   (b) Design Gib and Cotter joint to carry 35000N. Assume the gib, cotter and rods are made of same material with safe stresses in tension 20MPa; Shear 15MPa and crushing of 50MPa respectively.

6. Design a shaft to transmit power from motor to a lathe headstock through a pulley by means of a belt drive. The pulley weighs 200N and is located at 300mm from the centre of bearing. The diameter of pulley is 200mm and maximum power transmitted is 1kW at 120RPM. The angle of lap of belt is 1800 and coefficient of friction between belt and pulley is 0.3. The shock and fatigue factors for bending and twisting are 1.5 and 2.0 respectively. The allowable shear stress in the shaft is 40MPa.

7. Design and draw a cast iron flange coupling for mild steel shaft transmitting 90KW at 250 RPM. The allowable shear stress in the shaft is 40MPa and angle of twist is not to exceed 1^0 in a length of 20 diameters. The safe shear stress in coupling bolts is 30MPa.

8. Write design procedure for:
   (a) Compression springs
   (b) Torsional helical springs.

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