

R07

Code: R7310305

III B. Tech I Semester (R07) Supplementary Examinations, May 2012

DESIGN OF MACHINE MEMBERS - I

(Mechanical Engineering)

Time: 3 hours

Max Marks: 80

Answer any FIVE questions
All questions carry equal marks

- 1 (a) State the factors influencing the machine design.
(b) A crank shaft 20 mm diameter is mounted on ball bearings and carries a cam mid way between the bearings. The distance between the bearings is 150 mm. The follower which weighs 2500 N is out of adjustment so that impact is produced when it is contacted by cam. The height of fall is 0.25 mm. Determine the maximum bending stress in the shaft.
- 2 (a) What do you mean by endurance limit?
(b) Explain design procedure for variable loads.
- 3 Design a boiler joint (longitudinal & circumferential) to handle a pressure 1.8MPa with an internal diameter of 1.3 m.
- 4 (a) How are eccentrically loaded bolted joints designed
(b) A steam engine of effective diameter 30 cm is subjected to a steam pressure of 150N/cm^2 . The cylinder head is connected by 8 bolts having yield point 330N/mm^2 and endurance limit of 240N/mm^2 . The bolts are tightened with an initial pre-load of 1.5 times the steam load. A soft copper gasket is used to make the joint leak proof. Assuming a factor of safety of 2 find the size of bolt required. The stiffness factor for copper gasket may be taken as 0.5.
- 5 Design a cotter joint to connect two mild steel rods of equal diameter transmitting an axial force of 25kN which is subjected to slow reversals of direction. Tensile stress in the material is limited to 50MPa. The shear stress has the value $\frac{4}{5}$ of the permissible tensile stress. The crushing stress between the cotter and the rods is limited to 60MPa.
- 6 A mild steel shaft transmitting 15 kW at 280 rpm is supported on two bearings 750 mm apart and has keyed to it a pulley and a gear. The power is supplied to the shaft at a pulley of 450 mm diameter and the belt ends are horizontal and the tension ratio is 2. The pulley is keyed at a distance 200 mm to the right of the left hand bearing. A 150 mm diameter $14\frac{1}{2}^\circ$ involutes gear, located at 150 mm to the right of the right hand bearing, delivers power to a gear directly below the shaft. Calculate the diameter of the shaft assuming working stresses to be 70MPa in tension and 56MPa in shear.
- 7 Design a muff coupling to transmit 60 kW at 120 rpm. The shaft and key are made of the same material having allowable shear stress of 30N/mm^2 and compressive stress of 80N/mm^2 . The flange is made of cast iron with allowable shear stress of 15N/mm^2 .
- 8 A compression spring of spring constant "s" is cut into two springs having equal number of turns and the two springs are then used in parallel. What is the resulting spring constant of combination? How does the load carrying capacity of the resulting combination compare with that of the original spring?
