Code: R7310305

B.Tech III Year I Semester (R07) Supplementary Examinations December 2015
DESIGN OF MACHINE MEMBERS – I
(Mechanical Engineering)
(For 2008 regular admitted batch only)

Time: 3 hours   Max Marks: 80

Answer any FIVE questions
All questions carry equal marks
(Use of design data book permitted in the examination hall)
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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) Derive Soderberg's equation for design of variable loads.
   (b) What are the limitations of Soderberg's criterion?

3   A plate of 100 mm wide and 12.5 mm thick is to be welded to another plate by means of single transverse and double parallel fillet welds. Determine the length of the weld when in each case if the joint is subjected to varying loads. The recommended design stress in tension is not to exceed with 70.00 N/mm^2 and in shear 56.00 N/mm^2 for static loading.

4 (a) What are the types of bolted joints? Explain.
   (b) What are the merits and demerits of screw joints?

5 (a) Draw the sketches of various types of keys used and indicate where each one is preferred.
   (b) A belt pulley is fastened to a 75 mm diameter shaft running at 200 rpm by means of a key 26 mm wide and 125 mm long. Allowable stress for the shaft and the key materials are 40 MPa in shear and 100 MPa in crushing. Find the power transmitted and the depth of the key required.

6 (a) What materials are used for manufacture of shafts?
   (b) A hollow steel shaft transmits 500 kW at 1000 rpm. The maximum shear stress is 50 MPa. Find the outside and inside diameter of the shaft, if the outside diameter is twice the inside diameter, assuming that the maximum torque is 20 % greater than the mean torque.

7   Design a bush type flexible coupling for connecting a motor shaft to a pump shaft for the following service conditions:
        Power to be transmitted = 40 kW
        Motor speed = 1000 rpm
        Diameter of motor shaft = 50 mm
        Diameter of pump shaft =45 mm
        The allowable shear stress for pin is 35 MPa and the maximum allowable compressive stress for rubber bush is 2 MPa. The coupling is made of FG 200 Grey CI.

8 (a) Explain the general considerations in design of compression and extension springs.
   (b) A close coiled helical compression spring of 16 active coils has a spring stiffness of 10 N/mm. It is cut into two springs having 7 and 9 turns. Determine the spring stiffness of resulting springs.