PVP 12

Code: ME5T3

III B.Tech - I Semester – Regular Examinations - November 2014

DESIGN OF MACHINE MEMBERS-I
(MECHANICAL ENGINEERING)

Duration: 3 hours Marks: 5x14=70

Answer any FIVE questions. All questions carry equal marks

1. a) Differentiate between empirical design and rational design with suitable examples. 5 M

   b) Write R20 series and R20/3 series for numbers between 10 and 100. 5 M

   c) What is the purpose of standardization? 4 M

2. a) Derive the relationship between the yield strength in shear and the yield strength in tensile using the Maximum shear stress theory. 6 M

   b) The surface of a steel machine member is subjected to principal stresses 100 MPa (Tensile), 20 MPa (Tensile) and -80 MPa (compressive). What tensile strength is required to provide a factor of safety of 2.5 with respect to yielding according to the maximum shear stress theory and the Distortion energy theory? 8 M

3. a) What is meant by endurance strength of a material? How does the size, surface condition of a component and type of load affect such strength? 6 M

b) A steel rod is subjected to a tensile load which varies from 40 kN to 120 kN. Find the safe area of the bar. Yield point of the material = 570 MPa and endurance limit of the material = 350 MPa. Take factor of safety = 2. 8 M

4. a) Sketch the various end conditions for Helical compression springs. Indicate the number of active coils in each case. 4 M

b) A truck spring has 12 leaves and is supported at a span length of 90 cm, with central band of 70 mm wide. A load of 8 KN is applied at the centre of spring whose permissible stress is 320 MPa . The spring has a ratio of total depth to width of about 2.5. Determent the width, thickness, deflection and length of all leaves. 10 M

5. a) Sketch and explain the various types of Riveted Joints. 7 M

b) A single riveted lap joint is made in 15 mm thick plates with 20 mm diameter rivets. Determine the strength of the joint, if the pitch of the rivets is 60 mm. The permissible working stresses are 120 MPa in tension, 90 MPa in shear and 160 MPa in crushing. Find the efficiency of the joint. 7 M

6. a) Find out the inclination of the plane of maximum shear stress in the transverse fillet weld. Also find the expression for the maximum shear stress. 10 M

b) Compare the strength of the Transverse and Parallel fillet welds. 4 M

7. A bracket is bolted to a column by 6 bolts of equal size as shown in Figure 1. It carries a load of 50 kN at a distance of 150 mm from the centre of column. If the maximum stress in the bolts is to be limited to 150 MPa, determine the diameter of bolt. List the assumptions made in the analysis. All dimensions are in mm 14 M

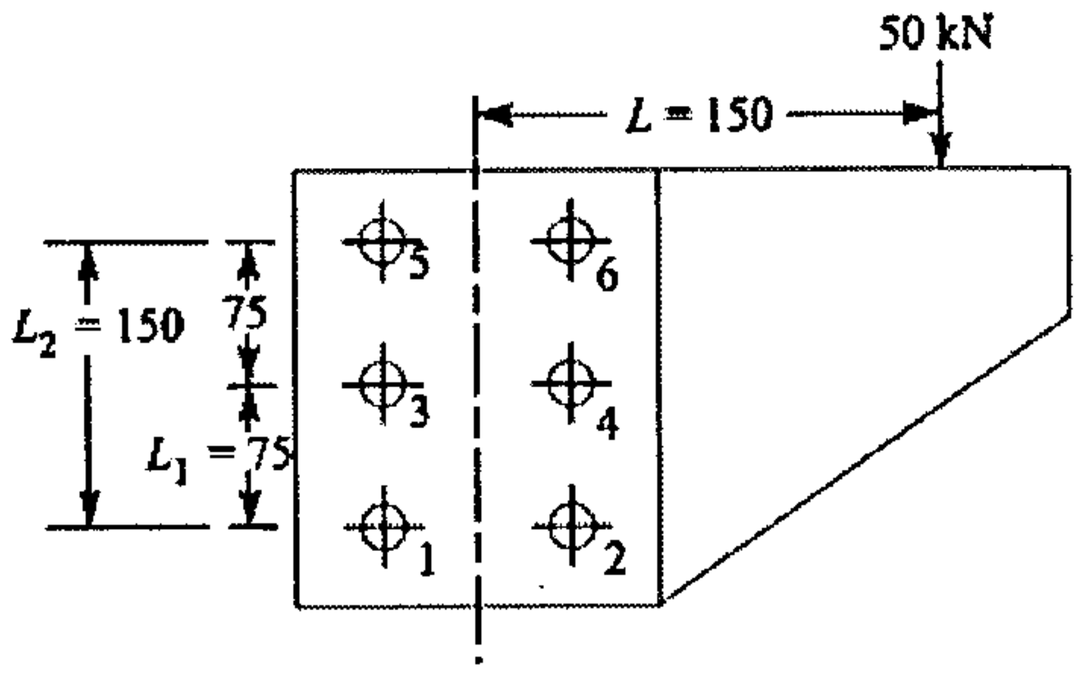

Figure-1

8. Design and sketch a cotter joint for fastening the piston rod to the cross head of the engine having cylinder diameter 250 mm and steam pressure 1.05 MPa. The thickness of the cotter is to be 0.3 times piston rod diameter at the point where cotter is located. Allowable stresses in tension, shear and compression are 50 MPa, 40 MPa, and 84 MPa respectively. 14 M