Code: ME5T3

III B.Tech - I Semester – Regular Examinations - November 2015

DESIGN OF MACHINE MEMBERS-I
(MECHANICAL ENGINEERING)

Duration: 3 hours   Max. Marks: 70

Answer any FIVE questions.   All questions carry equal marks

1 a) What are the various factors considered in standardization of design?   7 M

b) Classify various types of Machine Design.   7 M

2 a) A mild steel shaft of 50mm diameter is subjected to a bending moment of 2000N-m and a torque T. If the yield point of the steel in tension is 200MPa, Poisson's ratio=0.3, find the maximum value of this torque without causing yielding of the shaft according to   7 M
(i) Max. Shear stress theory
(ii) Distortion energy theory

b) Explain the difference and draw the stress-strain curve for mild steel and Cast Iron.   7 M

3. a) What is meant by stress concentration? Discuss how the stress concentration in a component can be reduced?   4 M

b) A bar of circular cross-section is subjected to alternating tensile forces varying from a minimum of 200 kN to a maximum of 500 kN. It is to be manufactured of a material with an ultimate tensile strength of 900 MPa and an endurance limit of 700 MPa. Determine the diameter of bar using safety factors of 3.5 related to ultimate tensile remain strength and 4 related to endurance limit and a stress concentration factor of 1.65 for remain fatigue load. Use Goodman straight line as basis for design.   10 M

4. a) Define the following   4 M
     i) Spring index   ii) Free length
   iii) Solid length   iv) Active number of coils

   b) Design a helical spring for a spring valve so as to meet the following requirements:
      Diameter of the seat valve = 70mm,
      operating pressure(when the valve begins to lift)=0.7N/mm^2
      Maximum pressure (when the valve blows off freely) = 0.75 N/mm^2, Lift of the valve during change of pressure = 4mm, Permissible shear stress τ = 560MPa, Take G = 0.84 x 10^5 MPa and C = 6.   10 M

5. The bracket as shown in Fig. is to carry a load of 45 kN. Determine the size of the rivet if the shear stress is not to exceed 40 MPa. Assume all rivets of the same size.   14 M
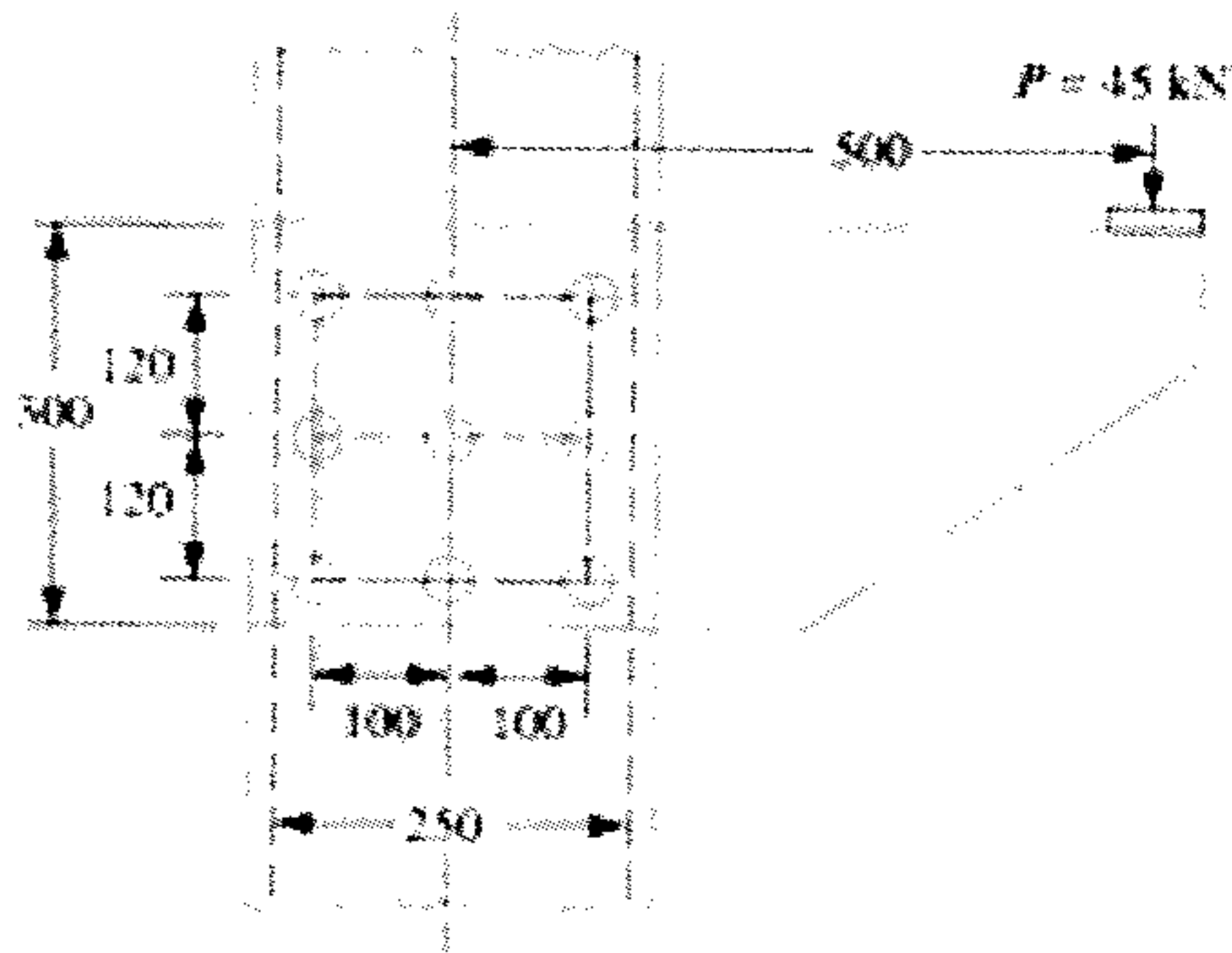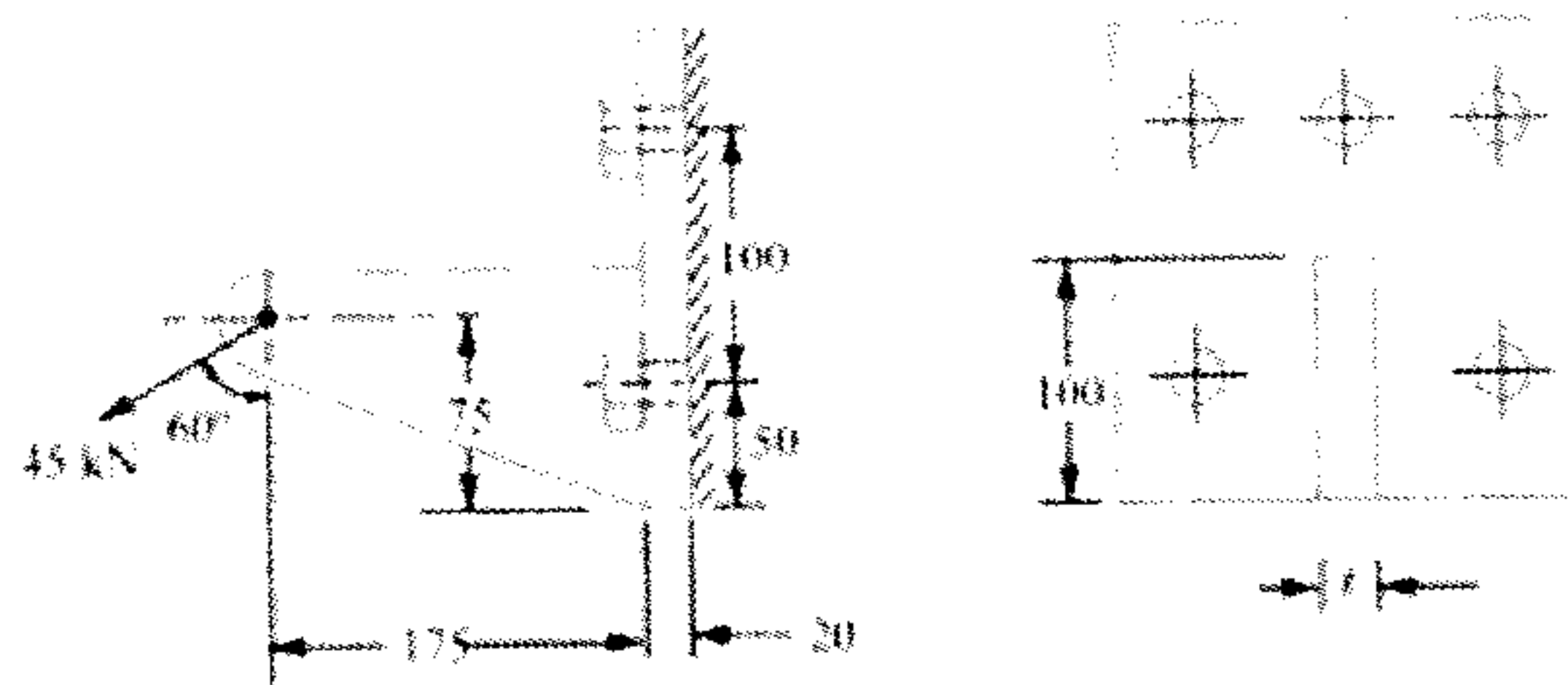
all dimensions are in mm.

6. a) What are primary and secondary shear stresses in eccentrically loaded welded joints? What are the assumptions made in evaluating them?   4 M

   b) A welded connection of steel plates, as shown in Figure, is subjected to an eccentric force of 10 kN. Determine the throat dimension of the welds, if the permissible shear stress is limited to 95 MPa.   10 M
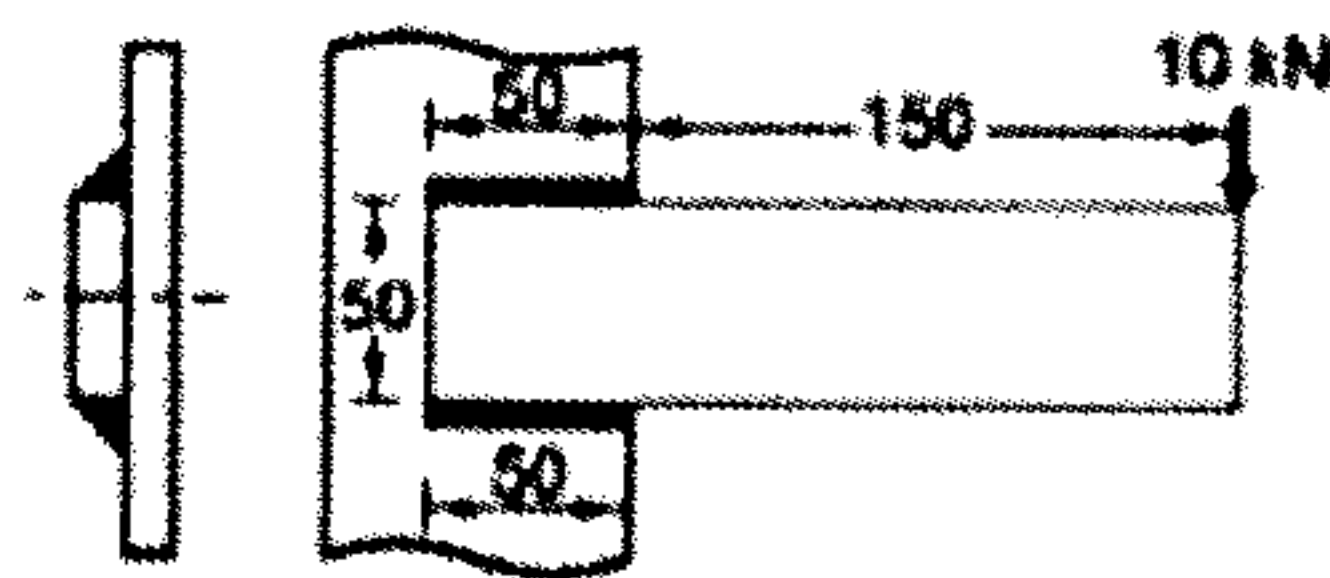
all dimensions are in mm.

7. A bracket, as shown in Fig, is fixed to a vertical steel column by means of five standard bolts. Determine the diameter of the fixing bolts. Assume safe working stresses of 70 MPa in tension and 50 MPa in shear.   14 M

all dimensions are in mm.

8. Design a Cotter Joint to support a load varying from 25KN in compression to 25KN in Tension. The material used in carbon steel for which the following stress may be used.
$\sigma_{t}=50mpa$; $\tau=35MPa$; $\sigma_{c}=90mpa$.   14 M