PVP 14

Code: ME3T5

II B.Tech - I Semester – Regular Examinations – December 2015

MECHANICS OF SOLIDS - I
(MECHANICAL ENGINEERING)

Duration: 3 hours Max. Marks: 70

PART – A

Answer ***all*** the questions. All questions carry equal marks

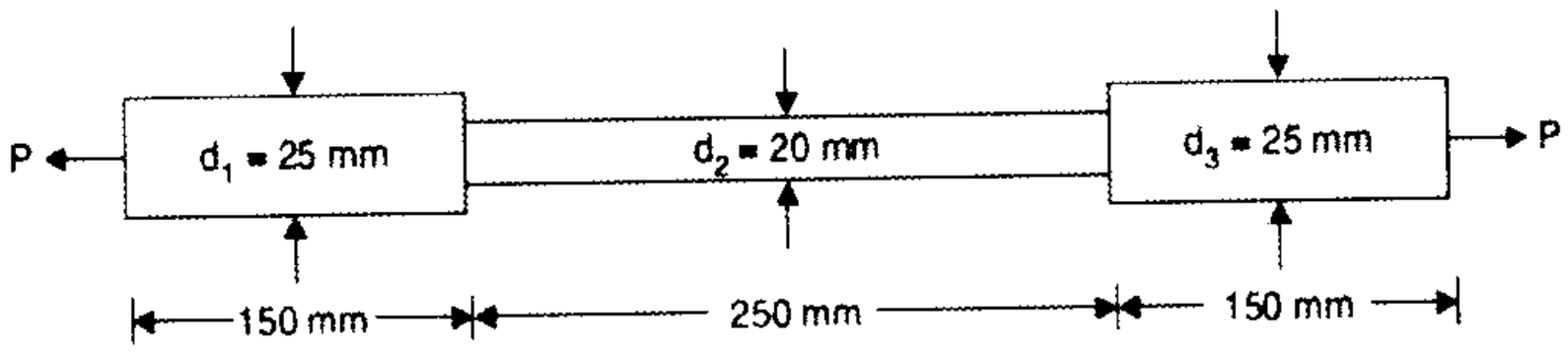
11x 2 = 22 M

1. a) Explain the term factor of safety.
   b) Write down the relations between three elastic constants.
   c) Define Poisson's ratio and volumetric strain.
   d) What is the effect of temperature in a composite bar?
   e) State the equations for normal and tangential stresses on an inclined plane, in an element under general two dimensional stress system.
   f) What do you mean by principal planes and principal stresses?
   g) Explain the following types of supports to beams:
      i) Simple support ii) Hinged support
   h) What do you mean by point of contraflexture?
   i) State any two assumptions made in deriving bending equation.
   j) Sketch the shear stress distribution across T- section.
   k) What is hooks law and explain it.

PART – B

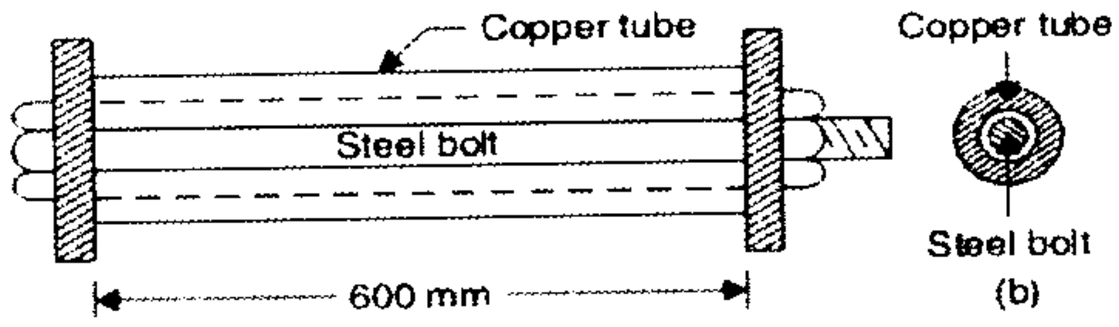
Answer any ***THREE*** questions. All questions carry equal marks. 3 x 16 = 48 M

2. a) The bar shown in Fig is tested in universal testing machine. It is observed that at a load of 40 kN, the total extension of the bar is 0.280 mm. Determine the Young's modulus of the material. 8 M



b) A steel wire of 8mm diameter is used to lift a weight of 1.5 KN at its lowest end. The density of the wire material is 8000Kg/m^3. Determine the elongation of the wire if the length of the wire is 100m. E=205GPa. 8 M

3. a) A steel bolt of 20 mm diameter passes centrally through a copper tube of internal diameter 28 mm and external diameter 40 mm. The length of whole assembly is 600 mm. After tight fitting of the assembly, the nut is over tightened by quarter of a turn. What are the stresses introduced in the bolt and tube, if pitch of nut is 2 mm? Take $E_s = 2 \times 10^5 N/mm^2$ and $E_c = 1.2 \times 10^5 N/mm^2$ 8 M



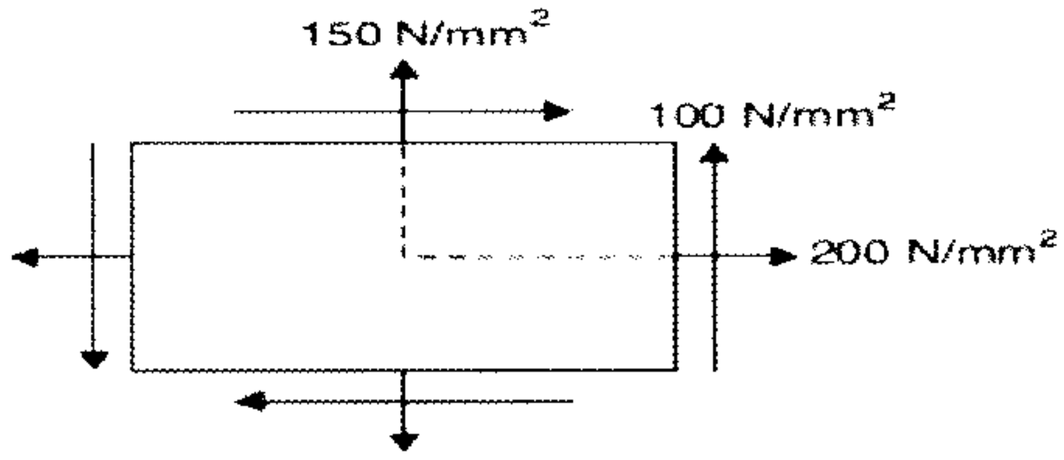
b) A weight of 2KN falls from a height of 24mm on to a collar fixed to a steel bar 14mm in diameter and 5.5m long. Determine the maximum stress induced in the bar. E_s=205GPa. 8 M

4. a) The overhanging beam ABC is supported at A and B, the span AB being 6 m. The overhang BC is 2 m. It carries a uniformly distributed load of 30 kN/m over a length of 3 m from A and concentrated load of 20 kN at free end. Draw SF and BM diagrams. 12 M

b) Derive the relation between bending moment and shear force in a beam. 4 M

5. a) Deduce expressions for stresses on an inclined plane in a body subjected to a bi-axial stress condition. 8 M

b) The state of stress at a point in a strained material is as shown in Figure. Determine
i) the direction of principal planes
ii) the magnitude of principal stresses and
iii) the magnitude of maximum shear stress.
Indicate the direction of all the above by a sketch. 8 M



6. a) Draw the bending stress and shear stress distribution across a rectangular section. 8 M

b) An I-section beam 340 mm x 200 mm has a web thickness of 10 mm and flange thickness of 20mm. It carries a shearing force of 100 kN. Sketch the shear stress distribution across the section. 8 M