

Seat No.	
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S.E. (Civil) (Part-I) (Semester - III) Examination, Dec. - 2013
STRUCTURAL MECHANICS - I
Sub. Code :42656

Day and Date : Friday, 27 - 12 - 2013

Total Marks : 100

Time : 10.00 a.m. to 1.00 p.m.

- Instructions :
- 1) Solve any three questions from Section I and any three questions from Section II.
 - 2) Figures to the right indicate full marks.
 - 3) Use of Non-Programmable scientific calculator is allowed.
 - 4) Assume any suitable data, if required, and clearly mention it.

SECTION-I

- Q1) a) Define working stress, Ultimate stress and Factor of safety. [6]
- b) For the bar shown in fig. 1 calculate the reaction produced by the lower support on the bar. [12]

Take $E = 200G \text{ N/m}^2$. Find also the stresses in the bars.

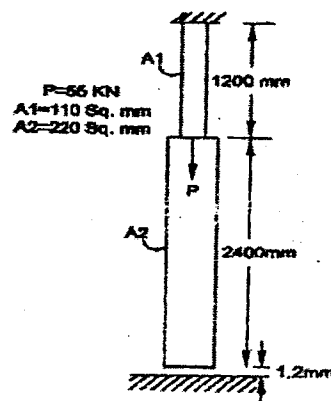


Fig 1

- Q2) a) Define uniaxial stress system. Derive the expression for volumetric strain in case of Rectangular bar when subjected to axial force along the length. [4]
- b) A Cast Iron flat 300mm long, 50mm wide, 30mm thick, is acted upon by the following forces uniformly distributed over the respective cross sections, 25kN in the direction of length (tensile), 350kN in the direction of width (compressive) and 200kN in the direction of thickness (tensile). Determine the change in the volume of the flat.

Take $E = 140GPa$. and $\mu = 0.25$.

[12]

P.T.O.

- Q3) a) Define Shear Force and Bending moment with illustration. [6]
 b) Draw SFD and BMD for the beam as shown in fig.2 Locate the point of maximum B.M. and contra flexure. What are the values of S.F. and B.M.? [10]

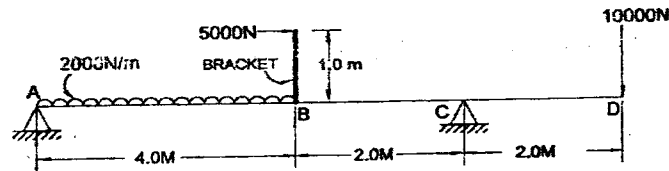


Fig 2

- Q4) a) Define thin cylinders. Name the stresses set up in thin cylinder subjected to internal fluid pressure. [4]
 b) A cylindrical vessel made of 3 mm thick steel plate has its ends closed by means of rigid flange plates. The internal length and diameter of vessel are 50cm and 25 cm respectively. Determine the longitudinal and circumferential stresses in the cylindrical shell due to an internal fluid pressure of 3 MPa. Also calculate increase in length, diameter and volume of the vessel. Take $E = 200 \text{ GPa}$, and $\nu = 0.30$. [12]

SECTION-II

- Q5) a) Derive the expression for flexural formula. [8]
 b) A cast iron beam is of T- section having Top flange -100mmx20mm and web-80mmx20mm; The beam carries a u.d.l. of 1.5 kN/m. on the entire 8m simply supported span. Determine the maximum tensile and maximum compressive stresses, due to Bending. [9]
- Q6) a) Explain how the equivalent cross section of composite beam is obtained. [4]
 b) An I-section beam having Flanges 200mmx25mm. each and web-300mm x12.5mm. It is subjected to shearing force of 200kN at a section. Find the shear stress distribution across the section. [12]
- Q7) a) Define [4]
 i) Resilience
 ii) Modulus of resilience.

- b) An unknown weight falls through a height of 10mm on a collar rigidly attached to the lower end of a vertical bar 5000mm long and 600mm² in section. If the maximum extension of the rod is to be 2mm. What is the corresponding stress and magnitude of the unknown weight q . Take $E = 2.0 \times 10^5 \text{ N/mm}^2$. [13]

- Q8) a) What are different methods of analysis of truss. [4]
 b) Find the forces in all the members of the truss loaded and supported as shown in fig. [12]

