

SUBJECT CODE NO: E-224
FACULTY OF ENGINEERING AND TECHNOLOGY
S.E.(CIVIL) (CGPA) Examination Nov/Dec 2017
Strength of Materials
(REVISED)

[Time: Three Hours]

[Max.Marks:80]

Please check whether you have got the right question paper.

- N.B
- i) Question No. 1 and 6 are compulsory. Attempt any two from remaining from each section.
 - ii) Figures to the right indicate full marks.
 - iii) Assume suitable data, if necessary.

Section A

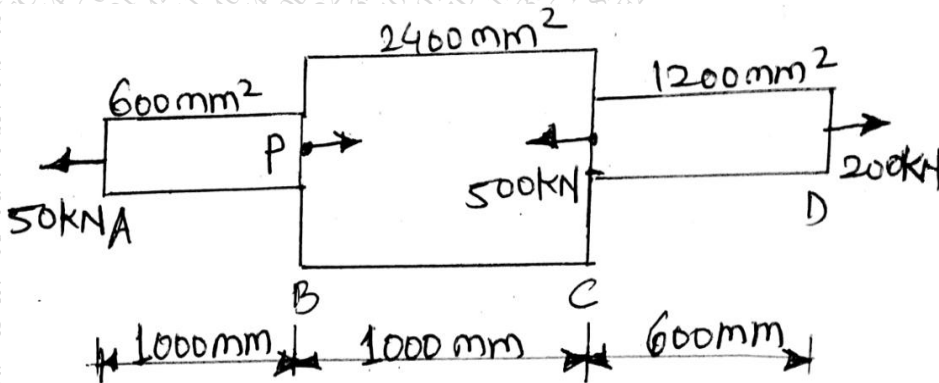
Q.1 Attempt any five.

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- a) State Hooke's law.
- b) Write flexure formula.
- c) Define Poisson's ratio.
- d) Define point of contraflexure.
- e) Explain types of stresses.
- f) Define modular ratio.
- g) Define modulus of Rigidity.
- h) Define Young's modulus.

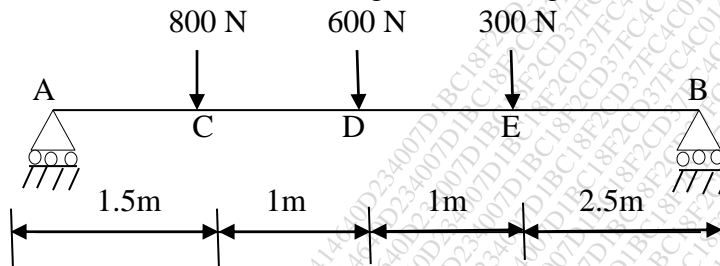
Q.2 a) A member ABCD is subjected to point Load as shown in Fig. Determine force 'P' and total 08 elongation of member.

Take $E = 210 \times 10^3 \text{ N/mm}^2$

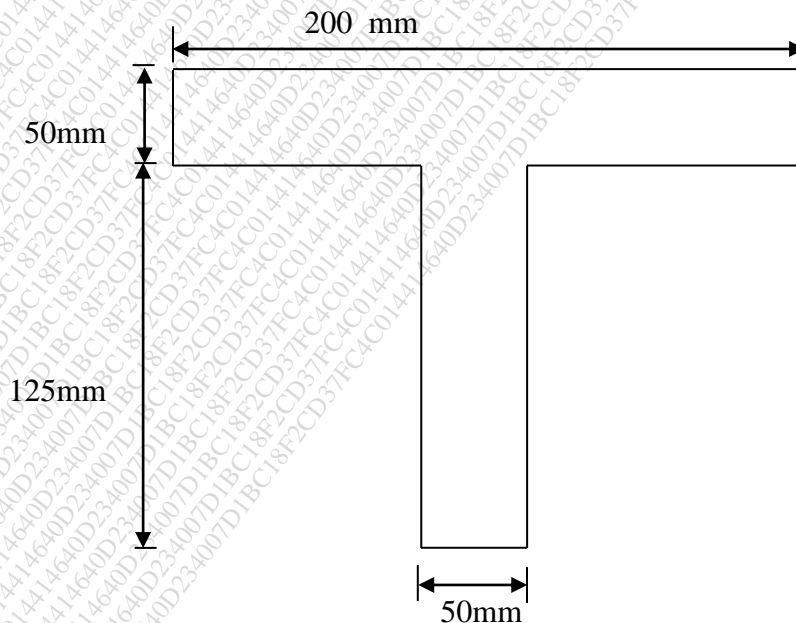


- b) A concrete column of cross-section area $400 \text{ mm} \times 400 \text{ mm}$ is reinforced by four longitudinal 50 mm diameter round bars of steel placed at each corner. If columns carries a load of 300 kN . Determine load carried by each bar and stresses produced in the concrete and steel bars. 07
- Young's modulus of elasticity of steel is 15 times that of concrete.

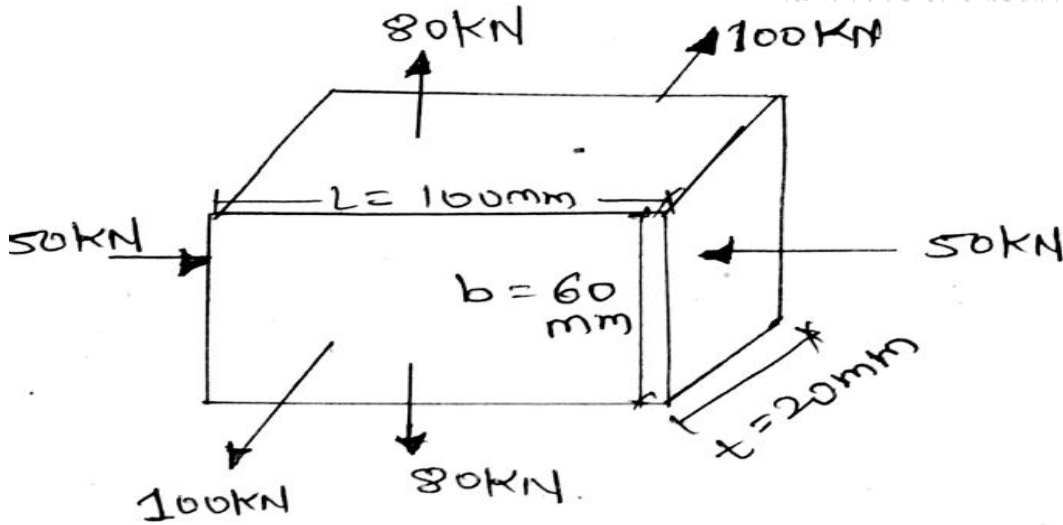
- Q.3 a) What are the types of beam. 03
- b) Draw shear force and bending moment diagram for beam shown in figure. 12



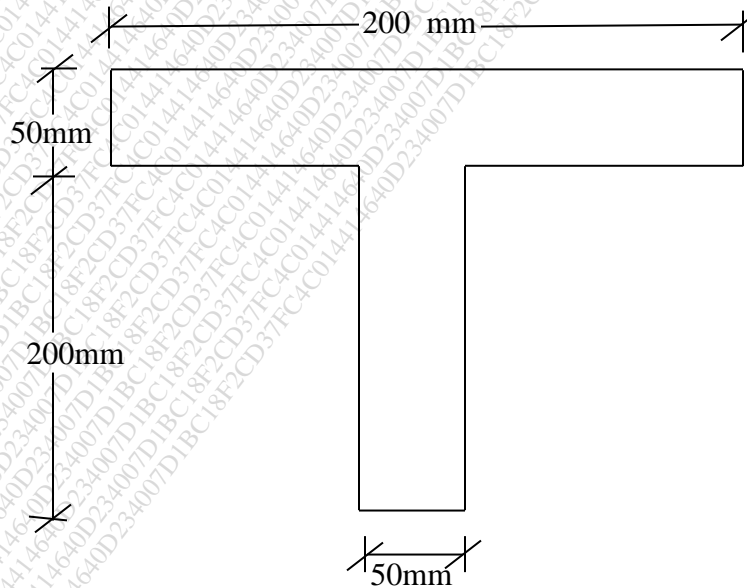
- Q.4 A 'T' section with flange $200 \text{ mm} \times 50 \text{ mm}$ and web $50 \text{ mm} \times 125 \text{ mm}$, is used as a cantilever beam of 2.5 m span subjected to U.d.L. of intensity 20 kN/m over its full span. Determine the maximum stresses in beam. 15



- Q.5 a) Determine change in each dimension and change in volume of block as shown in fig. 08
 Take $E = 2 \times 10^5 \text{ N/mm}^2$
 $\mu = 0.3$



- b) The T-shaped cross-section of a beam shown in fig. is subjected to vertical shear force of 100 kN . Calculate shear stress at the neutral axis and at the junction of the web and flange. 07



Section B

Q.6 Attempt any five

10

- What are the assumptions in theory of torsion.
- Define hoop stress.
- Write torsional formula.
- What are the assumptions in Euler's theory.
- Explain core or Kernel of section.
- Define strain energy.
- Define Principle stresses & principle planes.
- Define polar modulus.

Q.7 a) A steel shaft of solid circular section has to transmit 375 kW at 210 RPM. The maximum shear stress is not to exceed 50 MPa and the angle of twist is 1° in length of 3m. Design the suitable diameter of shaft. Take $C = 80$ GPa. 08

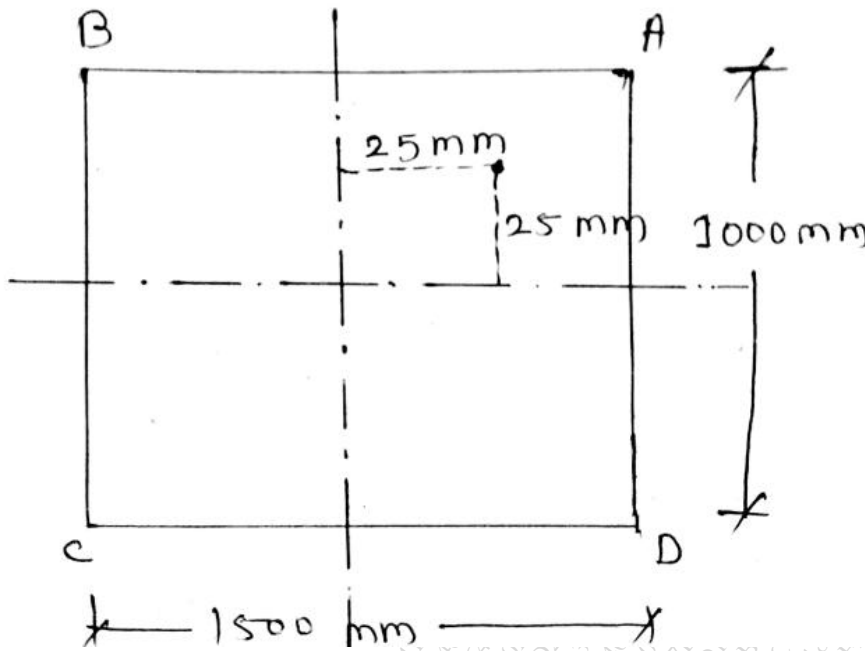
- b) A load of 100 N falls through a height of 2 cm onto a collar rigidly attached to the lower end of a vertical bar 1.5m long and 1.5 cm^2 cross-sectional area, the upper end of the vertical bar is fixed. Determine: 07
- Maximum instantaneous stress induced in the vertical bar.
 - Maximum instantaneous elongation
 - Strain energy stored in the vertical rod.
- Take $E = 2 \times 10^5 \text{ N/mm}^2$

Q.8 a) A cylindrical thin drum 800mm in diameter and 3m long has a shell thickness of 10mm. If the drum is subjected to an internal pressure of 2.5 N/mm^2 . Determine 08

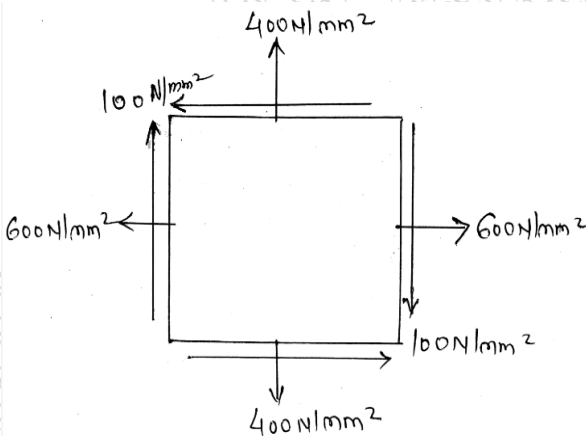
- The change in diameter.
- Change in length, and
- Change in volume.

Take $E = 2 \times 10^5 \text{ N/mm}^2$ Poisson's ratio = 0.25

- b) A rectangular pier is subjected to a compressive load of 450 kN as shown in fig. Find the stress intensities on all the four corners of pier. 07



- Q.9 At a point in a strain material there are two mutually \perp^{er} stresses of 600 N/mm^2 and 400 N/mm^2 both tensile. They are accompanied by shear stress of 100 N/mm^2 find 15
- 1) Principle stresses
 - 2) Position of principle plane
 - 3) Maximum shear stresses



- Q.10 A hollow column whose outside diameter is 200 mm has a thickness of 20mm. It is 4.5 m long and 15 is fixed at both ends. Compare Euler's critical load with Rankine's critical load taking $\sigma_c = 550 \text{ N/mm}^2$ and $\alpha = \frac{1}{1600}$, $E = 8 \times 10^4 \text{ N/mm}^2$.