



### SECTION-B

- With the help of stress-strain diagram differentiate between ductile and brittle materials.
- A concrete column ( $300\text{mm} \times 300\text{mm}$  in section) is reinforced by 10 longitudinal 20mm diameter round steel bars. The column carries a compressive load of 450kN. Find the stresses produced in the steel bars and concrete. Take  $E_{\text{steel}} = 200\text{GPa}$  and  $E_{\text{concrete}} = 15\text{GPa}$ .
- A beam having rectangular cross-section is freely supported on supports as shown in Fig. 1. It carries a UDL of 12 kN/m and a concentrated load of 9kN. If the stress in beam is not to exceed 8MPa. Design a suitable cross-section by assuming the depth of beam as twice of its width.

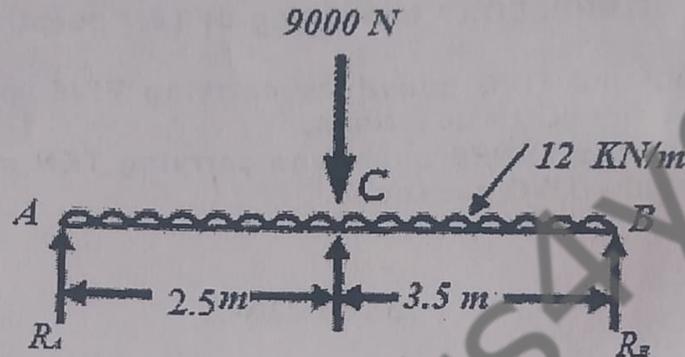


Fig. 1

- Calculate the safe compressive load on a hollow cast iron column (one end rigidly fixed and other end hinged) of 150 mm external diameter, 100 mm internal diameter and 10 m in length. Use Euler's formula with a factor of safety of 5 and  $E = 95\text{GPa}$ .
- Obtain the general equations to find the slope and deflection in a cantilever beam having length 'L' and carrying a UDL of intensity 'w', over its entire length and hence calculate the maximum deflection.

### SECTION-C

- The state of stress on an element is shown in Fig. 2. Determine: (a) Principal stresses and their orientations (b) Maximum/minimum shear stresses, their orientations along with the associated normal stresses (c) Values of normal and shear stresses on the indicated plane. Show all the results on properly oriented planes.

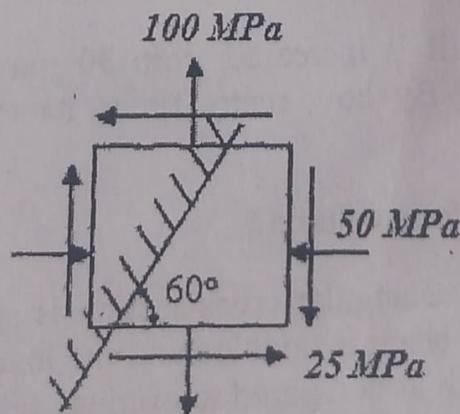


Fig.2

8. Draw shear force and bending moment diagrams for the beam loaded in Fig. 3. Label the salient points.

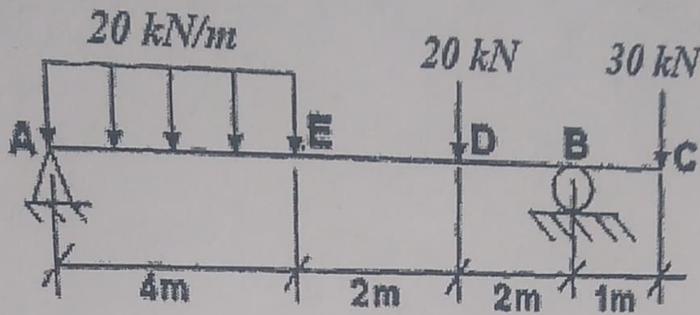


Fig.3

9. Stating the assumptions made, derive the torsion formula,  $\frac{T}{I_p} = \frac{\tau}{P} = \frac{C\theta}{L}$ . The symbols have their usual meaning.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.