Roll No. | | | | | | | | | | | | |

Total No. of Pages : 02

Total No. of Questions : 09

B.Tech.(Civil) (Sem.–3)

SOLID MECHANICS

Subject Code : CE-207

M.Code : 56004

Time : 3 Hrs. Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

1. Write briefly :

a) A material has a Young's Modulus of 2×10^5 N/mm^2 and Poisson Ratio of 0.25. Calculate Bulk Modulus.

b) What is the angle between two principle stresses?

c) What are the sign conventions used for calculating bending moments and shear force?

d) What are flitched beams?

e) Where do we use closed coiled helical springs?

f) Write the expression for maximum deflection of a simply supported beam of span carrying uniformly distributed load of '*w*' per unit length throughout the span.

g) Differentiate between short column and long column. Discuss how failure takes place in short and long column.

h) List the various theories of elastic failure.

i) What is the nature of variation of bending moment due to UDL?

j) A simply supported beam of span 2m is subjected to moment of 5 kN-m at the centre. Draw SFD for this beam.

SECTION-B

2. A solid round bar 3m long and 4cm in diameter is used as a column with both ends hinged. Determine the percentage change in the Euler's crippling load of the column if the end conditions are changed to both ends fixed. Take E = 200 GPa.

3. A rectangular block of material is subjected to a tensile stress of 100 N/mm^2 on one plane and a tensile stress of 50 N/mm^2 on a plane at right angles, together with shear stresses of 60 N/mm^2 on the same planes. Determine magnitude of the principal stresses, the magnitude of greatest shear stress and the direction of principal planes.

4. Derive the torsion equation and state the assumptions made.

5. Explain the graphical method of plotting bending moment and shear force diagram.

6. A steel bar of 500 mm length, 30 mm width and 20mm thickness is subjected to a direct tensile load of 60 KN. If Young's modulus of the bar material is 200 GN/m^2, find the strain energy and resilience of the bar. Find also the modulus of resilience if the elastic limit for the material in tension is $220N/m^2$.

SECTION-C

7. A simply supported beam of 14 meters carries two concentrated loads of 120 kN and 80 kN at 3 meters and 4.5 meters from the two ends respectively. Find the deflectiom under each load and maximum deflection. Take $I = 16 \times 10^8$ mm^4 and E = 210 kN/mm^2.

8. Derive the expression for Bending equation.

9. A composite beam is formed by fixing a 30 mm × 10mm steel strip symmetrically at the top of a timber joint of 100mm depth and 50 mm width. The composite beam is simply supported between supports 2m apart. If a load of 2kN is applied at the mid span, determine the stress distribution a thin section. E_{steel} = 200 GPa and E_{timber} = 10 GPa.

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.