

B.Tech. (Sem. - 3rd)
SOLID MECHANICS
SUBJECT CODE : CE - 207
Paper ID : [A0604]

[Note : Please fill subject code and paper ID on OMR]

Time : 03 Hours

Maximum Marks : 60

Instruction to Candidates:

- 1) Section - A is **Compulsory**.
- 2) Attempt any **Four** questions from Section - B.
- 3) Attempt any **Two** questions from Section - C.

Section - A**Q1)****(10 × 2 = 20)**

- a) What are the assumptions made in slope deflection method?
- b) A bar of steel is 0.7m long. For the first 0.2m it is 25 mm in diameter, for next 0.3m it is 20 mm in diameter and for the remaining 0.2m it is 15 mm in diameter. Find the change in length if it is subjected to a tensile load of 100 kN. The value of $E = 0.210 \text{ MN/mm}^2$.
- c) What is significance of Mohr's circle in calculating stresses?
- d) What are the limitations of Euler's formula?
- e) How will you derive the basic equation of elastic curve?
- f) What are the sign conventions used for calculating bending moments and shear force?
- g) What are the factors governing the selection of factor of safety?
- h) What are flitched beams?
- i) Derive the basic torsion equation.
- j) How eccentric loads effect the design of columns?

Section - B

(4 × 5 = 20)

- Q2) A simply supported beam of 6m span is loaded with a uniformly distributed load of 1.5 MN per meter over the entire span and concentrated load of 4 MN and 4 MN at a distance of 2m and 4m from the left hand support. Draw S.F. and B.M. diagrams for the beam and determine the magnitude and position of the maximum B.M.
- Q3) A beam of uniform cross section and of length L carries a uniformly distributed load w per unit length. It is simply supported at the left hand and at a point L/3 inside the right end. Calculate the deflection of the overhang end.
- Q4) Explain the graphical method of plotting bending moment and shear force diagram.
- Q5) Explain the following terms briefly :
- (a) Bending stress.
 - (b) Torsional stress.
 - (c) Hoop stress.
- Q6) Explain Conjugate beam method for calculating the deflection of beams.

Section - C

(2 × 10 = 20)

- Q7) Derive a relationship for maximum bending moment and maximum stress in case of column carrying eccentric load W at an eccentricity e.
- Q8) Derive a relationship for maximum bending moment and maximum stress in case of laterally loaded column with concentrated load (F) at mid height.
- Q9) Explain the following terms :
- (a) Maxwell's reciprocal theorem.
 - (b) Analysis of closed coil helical spring.
 - (c) Computation of principal stresses from principal strains.
 - (d) Basic equation for elastic curve.

