

Roll No.

Total No. of Questions : 09]

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21/21
B.Tech. (Sem. - 3rd)
STRENGTH OF MATERIALS - I
SUBJECT CODE : ME - 201
Paper ID : [A0801]

[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) Define Poisson's ratio?
- b) Distinguish between thin and thick cylinder?
- c) When a shear force at a section changes its sign, then bending moment at that section will be
 - (i) Zero.
 - (ii) Minimum.
 - (iii) Maximum.
 - (iv) Infinity.
- d) Define shear force and bending moment.
- e) What is meant equivalent length of column?
- f) What are the assumptions made in the theory of simple bending?
- g) The slenderness ratio of a long column is
 - (i) 10 - 20
 - (ii) 20 - 30
 - (iii) 50 - 60
 - (iv) Above 80
- h) What is fletched beam?
- i) Write torsion equation?
- j) Write are the assumptions in Euler's theory of columns?

Section - B

(4 × 5 = 20)

- Q2) A piece of elastic material is subjected to 3 mutually perpendicular tensile stresses. The strains in the three directions are in the ratio of 3:4:5. Find the magnitude of these stresses if the greatest stress is 65 MPa. Take Poisson's ratio as 1/3.
- Q3) Derive the expression for bending equation for bending of a beam after assuming the necessary assumptions.
- Q4) A cylinder of outer diameter 280mm and inner diameter 240mm shrunk over another cylinder of outer diameter slightly more than 240mm and inner diameter 200mm to form a compound cylinder. The shrink fit pressure is 10N/mm². If an internal pressure of 50N/mm² is applied to the compound cylinder, find the final stresses across the thickness. Draw sketches showing their variations.
- Q5) A simply supported beam of length 4m carries two point loads 3kN each at a distance of 1m from each end. $E = 2 \times 10^5 \text{ N/mm}^2$. $I = 108\text{mm}^4$. Using conjugate beam method determine slope at each end and deflection under each load.
- Q6) Solid shaft is subjected to a torque of 100Nm. Find the necessary shaft diameter if the allowable shear stress is 100 Mpa and the allowable twist is 3 degree per 10m length of the shaft. Take $C = 1 \times 10^5 \text{ N/mm}^2$.

Section - C

(2 × 10 = 20)

- Q7) Derive the expression for Euler's critical load for a column with both ends fixed.
- Q8) A simple supported beam of 6m length carries a concentrated load of 25kN at the mid span along with a uniformly distributed load of 35kN/m over the left 2m of the beam. Draw shear force and bending moment diagrams.
- Q9) Write short note on any two of the following :
- (a) Johnson's formula for columns.
 - (b) Principal stresses.
 - (c) Macaulay's method.

