

Roll No.

Total No. of Pages : 02

Total No. of Questions : 09

B.Tech. (CE) (2011 Onwards) (Sem.-3)

STRENGTH OF MATERIALS

Subject Code : BTCE-303

M.Code : 56074

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

Q1. Answer briefly :

- a) How are materials classified?
- b) Draw stress strain curve for mild steel.
- c) What are elastic constants? Define these.
- d) Discuss the applications of Mohr's circle
- e) Discuss the importance of sign conventions to draw shear force and bending moment diagrams.
- f) Define bending and shear stress.
- g) Illustrate Euler's buckling load for column.
- h) Define torsion.
- i) Discuss the effect of eccentricity on columns.
- j) Define second moment of area.

SECTION-B

2. The external and internal diameters of a hollow cylinder are 115 mm and 99 mm respectively. When the cylinder is compressed by an axial force of 180 kN, the outer diameter of the cylinder increases by 115.5×10^{-4} mm. Determine
 - (a) the increase in the inner diameter
 - (b) the increase in the wall thickness and
 - (c) Poisson's ratio of the material of the cylinder.
3. Two planes AB and BC which are at right angles carry shear stresses of intensity 17.5 N/mm^2 , while these planes also carry a tensile stress of 35 N/mm^2 respectively. Determine the principal planes and principal stresses. Also determine the maximum shear stress and the planes on which it acts.
4. A square column of wood is 2.5 m long with pinned ends. Taking a factor of safety of 2.5 in computing Euler critical load and also taking the allowable compressive stress as 12 N/mm^2 , find the size of the cross section, if the column has to safely support
 - (i) 150 kN
 - (ii) 275 kN. Take $E = 1.3 \times 10^4 \text{ N/mm}^2$.
5. State the assumptions in torsion theory. Explain the power transmitted by the shafts.
6. Discuss distortion energy theory with suitable example.

SECTION-C

7. A bar of steel is of square section 60 mm x 60 mm and 180 mm long. It is subjected to an axial compressive load of 300 kN. The lateral strain is prevented by the application of uniform external pressure. If $\nu = 0.3$ and $E = 2 \times 10^5 \text{ N/mm}^2$, find the alteration in the length of the bar. If however, only one-half the lateral strain is prevented what would be the alteration in the length of the bar?
8. A beam of I section 500 mm deep and 190 mm wide has flanges 25 mm thick and web 15 mm thick. It carries a shearing force of 400 kN at a section. Calculate the maximum intensity of shear stress in the section assuming the moment of inertia to be $6.45 \times 10^8 \text{ mm}^4$. Also calculate the total shear force carried by the web and sketch the shear stress distribution across the section.
9. A beam of length $(l+2a)$ has supports l apart with an overhang 'a' on each side. The beam carries a concentrated load W at each end. Construct shear force and bending moment diagrams.