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 bucking 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 $E = 1.3 \times 10^4$ N/mm^2.

5. State the assumptions in torsion theory. Explain the power transmitted by the shafts.

6. Discuss distorsion 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 $1/m = 0.3$ and $E = 2 \times 105$ 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 6.45×10^8 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 I 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.

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.