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

Paper ID : [A1133]

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) State the limitations of Euler's formula.

b) Define slenderness ratio.

c) Briefly describe distortion energy theory of failure.

d) What is generalized Hooke's law?

e) Define a composite bar.

f) What do you understand by '*an element in a state of simple shear*'?

g) Define the term obliquity and state how is it determined.

h) What is point of contraflexure?

i) What is neutral axis?

j) Define polar moment of inertia.

SECTION–B

2. The ultimate stress for a hollow steel column which carries an axial load of 1.9 MN is 480 N/mm^2. If the external diameter of the column is 200 mm, determine the internal diameter. Take the factor of safety as 4.

3. Derive an expression for the Young's modulus of elasticity in terms of bulk modulus.

4. At a certain point in a strained material, the stresses on two mutually perpendicular planes are 20 N/mm^2 and 10 N/mm^2 both tensile. They are accompanied by a shear stress of 10 N/mm^2. Find graphically, the location of the principal planes and evaluate the principle stresses.

5. Explain the concept of a free body diagram with the help of a suitable example.

6. A cantilever 1.5 m long is loaded with UDL of 2 KN/m run over a length of 1.25 m from the free end. It also carries a point load of 3 KN at a distance of 0.25 m from the free end. Draw the SF and BM diagrams of the cantilever.

SECTION–C

7. At a section of a mild steel shaft, the maximum torque is 8437.5 Nm and maximum bending moment is 5062.5 Nm. The diameter of the shaft is 90 mm and stress at the elastic limit in simple tension for the material is 220 N/mm^2. Will the material fail according to maximum shear stress theory? If not, find the factor of safety.

8. Derive an expression for the Euler's buckling load for a long column of length L when both its ends are fixed.

9. Two solid shafts AB and BC of aluminium and steel respectively are rigidly fastened together at B and attached to rigid supports at A and C such that they have a common axis. Shaft AB is 7.5 cm in diameter and 2 m in length, shaft BC is 5.5 cm in diameter and 1 m in length. A torque of 20,000 N-cm is applied at junction B. Compute the maximum shearing stresses in each material and angle of twist at the junction? Take modulus of rigidity of aluminium 0.3×10^5 N/mm^2 and that of steel as 0.9×10^5 N/mm^2.