Roll No. ☐☐☐☐☐☐☐☐☐☐☐☐☐   Total No. of Pages : 02

Total No. of Questions : 09

B.Tech.(ANE)/(Aerospace Engg.) (2012 Onwards)
(Sem.–3)
STRENGTH OF MATERIALS–I
Subject Code : ME-201
M.Code : 59001

Time : 3 Hrs.   Max. Marks : 60

INSTRUCTION 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.   **Answer briefly :**

   a.   How does limit of proportionality differ from limit of proportionality?

   b.   What is principal plane? What is its significance?

   c.   What effect is observed when shaft is twisted?

   d.   Draw a stress strain curve for Mild steel.

   e.   What is the relationship between hoop stress and longitudinal stress for thin cylinders?

   f.   What is section modulus?

   g.   What is point of contraflexure?

   h.   What do you mean by true stress?

   i.   What is Castigliano's theorem?

   j.   Differentiate between the column and strut.

SECTION - B

2. An axial pulls of 50kN is acting on a bar consisting of three sections of length 1,5m, 2m and 2.5m and diameters 20mm, 40mm, 30mm respectively, if $E = 2 \times 10^5$ N/mm^2 determine

   a. Stress in each section.

   b. Total extension of the bar.

3. Derive an expression for the Euler's crippling load for a long column with one end fixed and other end free.

4. Drive an expression for shear stress produced in a circular shaft subjected to torsion.

5. A cylindrical pressure vessel is fabricated from steel plating that has a thickness of 20 mm. The inner diameter of the vessel is 450mm, and its length is 2 m. Determine the maximum internal pressure that can be applied if the longitudinal stress is limited to 140MPa and the circumferential stress is limited to 60 MPa.

6. Calculate the modulus of rigidity and bulk modulus of a cylindrical bar of diameter 30mm and length of 1.5m. If the longitudinal strain in the bar during a tensile stress is four times the lateral strain. Find change in volume, when the bar is subjected to stress of 100 N/mm^2 Take $E = 1 \times l0^5$ N/mm^2.

SECTION-C

7. What is Macaulay's method? Derive an expression for deflection at any section of a simply supported beam with eccentric point load, using Macaulay's method.

8. A simply supported beam of length 8 m rests on supports 5 m apart, the right hand end is overhanging by 2 m and left hand end is overhung by 1m. The beam carries a uniformly distributed load of 5kN/m over the entire length. Draw S.F. and B.M. diagram and find the point of contra flexure, if any.

9. Derive the complete flexural formula $\dfrac{M}{I} = \dfrac{\sigma}{Y} = \dfrac{E}{R}$ pure bending with assumptions.

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.