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

Paper ID : [A0801]

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) Define stress and name various types of stresses.

b) What do you mean by principal planes? What type of stresses can act on principal planes?

c) Define shear force and give its sign conventions.

d) Write the relation between loading, shear force and bending moment.

e) What do you mean by flitched beams? Show a flitched beam with a sketch.

f) What do you mean by torsion? What is difference between torsion and torque?

g) State and explain Hoop stress.

h) Define slenderness ratio.

i) Distinguish between slope and deflection of a beam.

j) Name various methods used to find slope and deflection.

SECTION-B

2. A square steel rod 20 mm × 20 mm in section is to carry an axial compressive load of 100 kN. Calculate stress, strain and the shortening in a length of 50 mm. $E = 2.14 \times 10^8$ kN/m^2.

3. A hollow shaft is to transmit 300 kW at 80 rpm. If the shear stress is not to exceed 60 MN/m^2 and internal diameter is 0.6 of the external diameter, find the external and internal diameters assuming that the maximum torque is 1.4 times the mean.

4. A boiler shell is to be made of 15 mm thick plate having tensile stress of 120 MN/m^2. If the efficiencies of the longitudinal and circumferential joints are 70% and 30% respectively, determine :

   a) Maximum permissible diameter of the shell for an internal pressure of 2 MN/m^2.

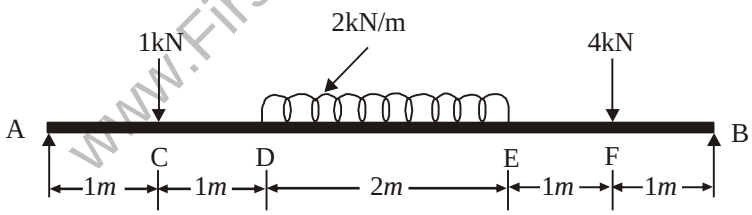
   b) Permissible intensity of internal pressure when the shell diameter is 1.5 m.

5. Derive Euler's formula for column with both ends hinged.

6. A uniformly distributed load w/unit length is acting at whole span of a simply supported beam. The length of the beam is L. Derive the formulae to find maximum slope and deflection by double integration method.

SECTION-C

7. Draw the shear force and bending moment diagrams for a beam shown below. Clearly mark the position of the maximum bending moment and determine its value.



8. Two wooden planks 150 mm × 50 mm each are connected to form a T-section of a beam. If a moment of 3.4 kNM is applied around the horizontal neutral axis, inducing tension below the neutral axis, find the stresses in extreme fibres of the cross-section.

9. Write short notes on :

   a) Ellipse of stress and its applications.

   b) Moment area method to find slope and deflection.