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

Total No. of Questions : 09

B.Tech. (ME) (Sem.–3)
STRENGTH OF MATERIALS – I
Subject Code : BTME-301
M.Code : 59111
Date of Examination : 24-05-2023

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) What do you mean by temperature stresses? Explain.

   b) What do you mean by principal planes and principal stresses?

   c) How Mohr's circle is useful in the stress analysis problems?

   d) What is the relation between shear force and loading function of a beam?

   e) What do you mean by the terms 'neutral axis' and 'neutral surface'?

   f) Enumerate assumption made in the theory of torsion.

   g) Define equivalent length of columns.

   h) State the limitations of Euler's formula.

   i) Define the terms strength criterion, stiffness criterion and elastic curve.

   j) Why a hollow shaft is preferred over a solid shaft?

SECTION-B

2. A 20 mm thick and 200 mm wide steel plate tapers uniformly to 10 mm thickness and 150 mm width over a length of 2 m. Determine the increase in length when a pull of 18 kN is applied. Take E = 200 GPa.

3. A 250 mm deep and 150 mm wide rectangular beam is subjected to a maximum bending moment of 250 kN-m. Determine the maximum stress produced in the beam and the radius of curvature for the portion of the beam where bending is maximum.

4. A Simply supported beam of length L carries a uniformly distributed load of w per unit length over the whole span. Using the double integration method, find the slope and deflection at mid and end points.

5. A 4m long hollow alloy tube with the inside and outside diameters as 36 mm and 48 mm respectively elongates by 3 mm under a tensile force of 50 kN. Determine the buckling load for the tube when it is used as a column with both end pinned and with a factor of safety of 5.

6. Show that in a direct stress system, the maximum shear stress in a body is half the magnitude of applied stress.

SECTION-C

7. Determine the maximum shear stresses in compound stress systems and show that the planes of maximum shear stresses lie at 45° to the planes of principal stresses.

8. Compare the weights of equal lengths of a solid and hollow shaft to transmit a given torque for the same maximum stress if the inside diameter of the shaft is three fourth of the outside.

9. A simply supported beam of length 8 m rests on supports 6 m apart, the right hand end is overhanging by 2 m. The beam carries a uniformly distributed load of 1500 N/m over the entire length. Draw S.F. and B.M. diagram and find the point of contra flexure, if any.

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.