

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 $E = 200 \text{ GPa}$.
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.