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

Total No. of Questions : 09

B.Tech.(ME) (Sem.–3)

STRENGTH OF MATERIALS-I

Subject Code : BTME-304-18

M.Code : 76421

Date of Examination : 29-05-2023

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) Define Hook's law.

(b) What happens to a material beyond its elastic limit?

(c) What are the uses of bending moment and shear force diagrams?

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

(e) What is the difference between pure bending and eccentric bending?

(f) Define torsional rigidity.

(g) What are the factors affecting the strength of a column or strut?

(h) Define slenderness ratio.

(i) How do you calculate the maximum deflection of a beam?

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

SECTION-B

2. A steel bar 340 mm long, 55 mm wide and 12 mm thick is subjected to an axial pull of 90kN. Find the change in length, width, thickness and volume of the bar. Given: E = 210GPa, Poisson's ratio = 0.33.

3. A rectangular beam 20 cm deep by 10 cm wide is subjected to maximum bending moment of 500 kNm. Determine the maximum stress in the beam. If the value of E for the material is 207 GN/m^2, find the radius of curvature for that portion of the beam where the bending moment is maximum.

4. How can Mohr's Circle be used to determine the stresses acting on a plane at a given orientation in a loaded material? Provide a step-by-step explanation.

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

6. A horizontal girder of steel having uniform section is 14 m long and is simply supported at its ends. It carries concentrated loads of 120 kN and 80 kN at two points 3 m and 4.5 m from the two ends respectively. For the section of the girder, $I = 16 \times 10^4$ cm^4, and E for steel is 210 GPa. Calculate the deflection of the girder at points under the two loads.

SECTION-C

7. A horizontal beam AB of length 8 m is simply supported at A and B. It carries U.D.L. of 3 kN/m over the entire span and a clockwise moment of 12 kNm is applied in the plane of the beam at point C, 5 m from A. Draw the shearing force and bending moment diagrams and determine the position and magnitude of maximum bending moment.

8. A solid shaft of 200 mm diameter is to be replaced by a hollow steel shaft with internal diameter equal to 0.5 D where D is the external diameter. Design the hollow shaft and find the saving in material. The value of maximum shear stress may be assumed as same for both the shafts.

9. Write short notes on the following :

   (a) Different types of end conditions for columns and struts and their effect on buckling behavior.

   (b) Moment area method to find slope and deflection.

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.