

Roll No.

Total No. of Pages : 02

Total No. of Questions : 09

B.Tech.(ME) (Sem.-3)
STRENGTH OF MATERIALS-I

Subject Code : BTME304-18

M.Code : 76421

Date of Examination : 18-12-2023

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) Draw Mohr's circle for two-dimension stress condition $\sigma_x = 10$ MPa, $\sigma_y = -10$ MPa and $\tau_{xy} = 0$.
- b) Define Poisson's ratio.
- c) Enlist various types of loads supported by beams.
- d) Write expression for polar modulus for a hollow shaft.
- e) Enlist various modes of failure observed in columns.
- f) What are the methods for finding out the slope and deflection for beams?
- g) What are composite beams?
- h) What is section modulus?
- i) Enlist various assumptions made in theory of torsion.
- j) Why is deflection of beams needed for engineering applications?

SECTION-B

2. Draw a typical stress strain curve for mild steel under tension, on the curve locate the salient points.
3. Drive standard relation for bending of beams based on the theory of pure bending.
4. A cantilever beam of 2m length and 15mm × 15mm in section fails on applying a load of 500 N at the free end. Find the maximum UDL that can be applied safely to a 45mm wide, 70mm deep and 1.5m long simply supported beam made of same material.
5. A solid circular shaft of 150 mm diameter and 5 m length is fixed rigidly at both ends. At a distance of 2 m from left end, a torque of 30kN-m is applied. Find the angle of twist of the rod at the point of application of the torque and the maximum shear stress developed in the shaft assuming modulus of rigidity of the shaft material as $8 \times 10^4 \text{ N/mm}^2$.
6. Calculate the Euler's buckling load for a column with one end fixed and other end free and made of a tube that is 4 m long, internal diameter of 3 cm and 4 mm wall thickness. $E = 75 \text{ GPa}$.

SECTION - C

7. Draw the shear force and bending moment diagram for the beam shown in Figure 1.

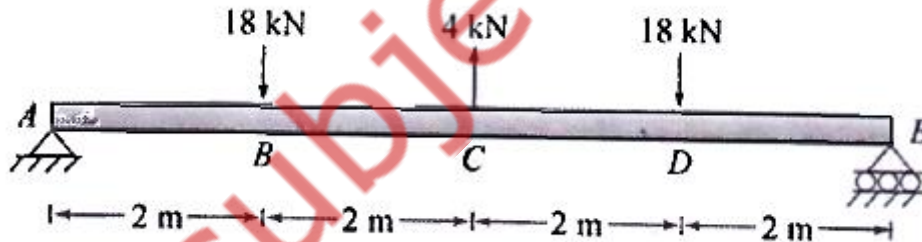


FIG.1

8. At a point in a material, there are normal stresses of shear stress 30 MPa and 60 MPa both tensile together with a shearing stress of 25 MPa. Find the values of principal stresses and inclination of principal planes. Also, find the orientation of planes of maximum shear stress.
9. A cantilever beam of length 'L' and flexural rigidity "EI" is loaded with a uniformly distributed load of intensity "w". Find the expression for slope, and deflection at the free end.

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.