

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 : 21-06-2024

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) Write expression for polar modulus of a hollow shaft.
- b) Discuss how shear force diagram varies over a span of beam with the nature of load?
- c) Drive expression for section modulus of a circular section.
- d) Briefly differentiate stress strain behaviour of ductile and brittle materials.
- e) Discuss the classification of columns.
- f) Compare the relative positions of principal planes and plane of maximum shear stress.
- g) What is composite shaft?
- h) Discuss how Rankine's formula gives reliable result for short column and long columns?
- i) Enlist various methods to find slope and deflection for beams.
- j) Define yield strength and ultimate strength of a material.

SECTION-B

2. Derive expression for extension of a bar due to self weight.
3. A hollow shaft has an external diameter of 300 mm and a bore of 150 mm diameter. When transmitting power, it is found that the angle of twist is 0.5° in a length of 4 m. Find a) the power transmitted if the speed is 300 rpm and b) the maximum shear stress in the shaft. $G = 0.8 \times 10^5$ MPa.
4. Draw a typical stress strain curve for mild steel under tension, on the curve locate the salient points.
5. Enlist various assumptions made in the derivation of bending equation. Drive bending equation for a rectangular section beam.
6. A steel rod of 50 mm diameter and 6 m length is connected to two grips and the rod is maintained at a temperature of 100°C . Determine the stress and pull exerted when the temperature falls to 20°C , if (a) the ends do not yield, and (b) the end yield by 0.15 cm.

Take $E = 2 \times 10^5$ N/mm² and $\alpha = 12 \times 10^{-6}$ PC.

SECTION-C

7. Draw the shear force and bending moment diagrams for the beam shown in Fig. 1. Also calculate the maximum bending moment.

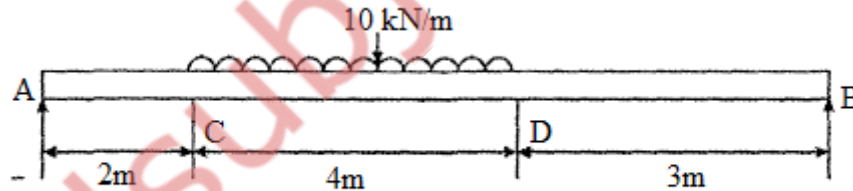


Fig.1

8. Derive expression for crippling load for long column with one end fixed and the other end free.
9. A cantilever beam of length 3 m carries a point load of 60 kN at a distance of 2 m from the fixed end. Use double integration method to find (a) slope at the free end and (b) deflection at the free end. Consider $E = 2 \times 10^5$ N/mm² and $I = 10^8$ mm⁴

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.