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

Total No. of Questions : 09

B.Tech.(ME) (2018 Batch)   (Sem.–3)
STRENGTH OF MATERIALS-I
Subject Code : BTME-304-18
M.Code : 76421

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 stress and strain.

    (b) Define Young's modulus of eleasticity.

    (c) State generalized Hook's law.

    (d) Explain sign conventions for bending moment in case of a simply supported beam.

    (e) Give practical applications of flitched beams.

    (f) Write the formula of power transmitted by a shaft.

    (g) Distinguish between crushing and buckling.

    (h) Define radius of gyration.

    (i) Distinguish between slope and deflection of a beam.

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

SECTION-B

2. A steel bar is 900 mm long; its two ends are 40 mm and 30 mm in diameter and the length of each rod is 200 mm. The middle portion of the bar is 15 mm in diameter and 500 mm long. If the bar is subjected to an axial load of 15 kN, find its total extension. Take, $E = 200$ GN/m^2.

3. A cantilever of length 10 m carries point loads of 3kN and 5 kN at distance of 3 m and 6 m respectively from free end, and uniformly distributed load of 2 kN/m between two point loads. Draw shearing force and bending moment diagram.

4. What must be the length of a 5 mm diameter aluminium wire so that it can be twisted through one complete revolution without exceeding a shearing stress of 42 MN/m^2? Take, modulus of rigidity = 27 GN/m^2.

5. Distinguish between the application of Euler's formula and Rankine-Gordon's formula giving suitable examples.

6. Use double integration method to find slope and deflection at free end of a cantilever of length l carrying uniformly distributed load w per unit length over whole length.

SECTION-C

7. Draw the Mohr's stress circle for direct stresses of 65 MN/m^2 (tensile) and 35 MN/m^2 (compressive) and estimate the magnitude and direction of the resultant stresses on planes making angles of 20° and 65° with the plane of the first principal stress. Find also the normal and tangential stresses on these planes.

8. Two wooden planks 150 mm × 50 mm each are connected to form a T-section of a beam. If a moment of 3.4 kNm is applied around the horizontal neutral axis, inducing tension below the neutral axis, find the stresses at the extreme fibres of the cross-section. Also calculate the total tensile force on the cross-section.

9. Write short notes on :

    (a) Ellipse of stress and its applications

    (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.