Roll No.
Total No. of Pages : 02
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## B.Tech.(ME) (2018 Batch) (Sem.-3) STRENGTH OF MATERIALS-I <br> Subject Code : BTME-304-18 <br> 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, $\mathrm{E}=200 \mathrm{GN} / \mathrm{m}^{2}$.
3. A cantilever of length 10 m carries point loads of 3 kN and 5 kN at distance of 3 m and 6 m respectively from free end, and uniformly distributed load of $2 \mathrm{kN} / \mathrm{m}$ 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 $42 \mathrm{MN} / \mathrm{m}^{2}$ ? Take, modulus of rigidity $=27 \mathrm{GN} / \mathrm{m}^{2}$.
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 $65 \mathrm{MN} / \mathrm{m}^{2}$ (tensile) and $35 \mathrm{MN} / \mathrm{m}^{2}$ (compressive) and estimate the magnitude and direction of the resultant stresses on planes making angles of $20^{\circ}$ and $65^{\circ}$ with the plane of the first principal stress. Find also the normal and tangential stresses on these planes.
8. Two wooden planks $150 \mathrm{~mm} \times 50 \mathrm{~mm}$ 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.

