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Total No. of Pages : 02

Total No. of Questions : 18

B.Tech. (AE) (2012 to 2017) (Sem.-3)

**MECHANICS OF MATERIALS**

Subject Code : BTAE-301

M.Code : 54109

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****Write briefly :**

1. Define the term stress. What are different types of stresses?
2. What is the use of stress-strain diagram?
3. What will be change in modulus of elasticity of a wire when length of wire is doubled, and load is increased by factor of 4?
4. What do you mean by thermal stresses?
5. Define point of contraflexure.
6. What is relationship between shear force and bending moment?
7. Define the term torsional rigidity.
8. State maximum principle shear-strain theory.
9. Write the limitations of Euler's theory.
10. What are thick and thin cylinders?

**SECTION-B**

11. A symmetrical section 200 mm deep has a moment of inertia of  $2.26 \times 10^{-5} \text{ m}^4$  about its neutral axis. Determine the longest span over which, when simply supported, the beam would carry a uniformly distributed load of 3kN/m run without the stress due to bending exceeding  $10 \text{ MN/m}^2$ .

12. Find the value of  $P$  necessary for equilibrium, if  $E = 210 \text{ kN/mm}^2$ . Also determine the elongation of the bar.

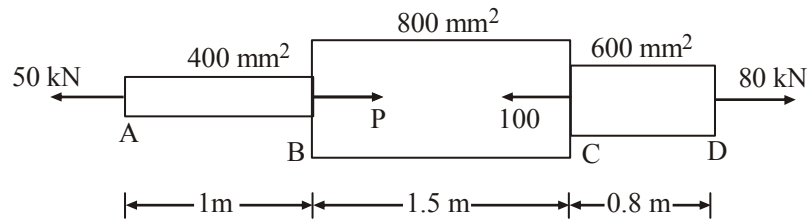


FIG.1

13. Draw the SFD and BMD for the beam shown below.

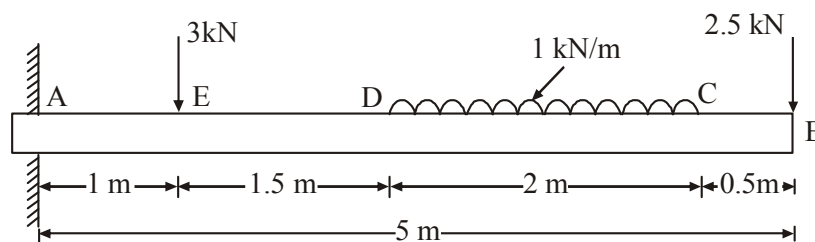


FIG.2

14. Prove that for a rectangular cross-section beam, the maximum shear stress is 1.5 times the average shear stress.
15. Stating the assumptions, drive the torsion equation for a circular shaft. Assume suitable parameters.

### SECTION-C

16. Derive the Euler's formula for long columns having both ends hinged or pinned.
17. A boiler shell is to be made of 15mm thick plate having tensile stress of  $120 \text{ MN/m}^2$ . If the efficiencies of the longitudinal and circumferential joints are 70% and 30% respectively, determine :
- Maximum permissible diameter of the shell for an internal pressure of  $2 \text{ MN/m}^2$ .
  - Permissible intensity of internal pressure when the shell diameter is 1.5 m.
18. A hollow shaft having an inside diameter 60% of its outer diameter is to replace a solid shaft transmitting the same power at same speed. Calculate the percentage saving in material. The material of hollow and solid shaft is same.

**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.**