

Roll No. 

Total No. of Pages : 03

Total No. of Questions : 09

E.Tech.(ANE/ME/IE)(Sem.-3<sup>rd</sup>)**STRENGTH OF MATERIALS-I**

Subject Code : ME-201 (2008-09 Batch)

Paper ID : [A0801]

Time : 3 Hrs.

Max. Marks : 60

**INSTRUCTION TO CANDIDATES :**

- SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
- SECTION-B contains FIVE questions carrying FIVE marks each and students has to attempt any FOUR questions.
- SECTION-C contains THREE questions carrying TEN marks each and students has to attempt any TWO questions.

**SECTION-A**

1. Write briefly :

- Differentiate with illustrations between normal stress and shear stress.
- Derive the relationship between modulus of elasticity and modulus of rigidity of a material within linear elastic range.
- State the relationship between B.M. and S.F. at any section of the beam or cantilever.
- What do you understand by points of contraflexure ? Explain.
- What is a flitched beam ? What are advantages of using a flitched beam ?
- What assumptions are made in the theory of pure torsion ?
- Derive the formulae for hoop stress and longitudinal stress in case of thin cylindrical shell.
- What do you understand by column or strut ? Explain.
- What assumptions are made in Euler's formula for crippling load?
- Explain briefly the moment area method.

**SECTION-B**

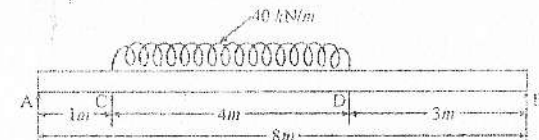
- Explain with figures the normal stress-strain diagram and actual stress-strain diagram. Describe various points and regions.
- Describe procedure for drawing Mohr's circle of stresses.
- Derive the relation :  $\frac{M}{I} = \frac{\sigma}{y} = \frac{E}{R}$

where,  $M$  = Bending moment,  $I$  = M.O.I;  $\sigma$  = Bending stress $y$  = Distance from N.A.;  $E$  = Young's modulus and  
 $R$  = Radius of curvature

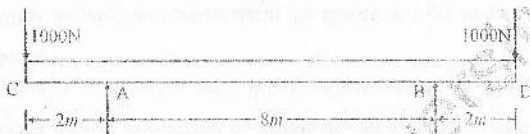
- A solid circular shaft and a hollow circular shaft whose diameter is  $3/4$ th of the outside diameter, are of the same material, of equal lengths and are required to transmit a given torque. Compare the weights of these two shafts if the maximum shear stress developed in the two shafts is equal.
- A column of timber section  $15 \text{ cm} \times 20 \text{ cm}$  is 6 meter long, both ends being fixed. If the Young's modulus for timber is  $17.5 \text{ kN/mm}^2$ , determine
  - Crippling load and
  - Safe load for the column if factor of safety is 3.0.

**SECTION-C**

- A beam of length 8m is simply supported at its ends. It carries a uniformly distributed load of  $40 \text{ kN/m}$  as shown in the Fig. below. Determine the deflection of the beam at its mid point. Take  $E = 2 \times 10^5 \text{ N/mm}^2$  and  $I = 4.5 \times 10^8 \text{ mm}^4$ .



8. A beam of length 12m is simply supported at two supports which are 8m apart, with an overhang of 2m on each side as shown in the Fig. below. The beam carries concentrated loads of 1000N at each end. Draw S.F. and B.M. diagrams.



9. A simply supported beam AB of length 6m is hinged at A and B. It is subjected to a clockwise couple of 24 kN-m at a distance of 2m from the left end A. Draw S.F. and B.M. diagrams.

