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Total No. of Questions : 09

B.Tech.(CE) (Sem.–3) (2011 Batch)

STRENGTH OF MATERIALS

Subject Code : BTCE–303

Paper ID : [A1133]

Time : 3 Hrs. Max. Marks : 60

INSTRUCTION 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 has to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students has to attempt any TWO questions.

SECTION-A

1. Write briefly :

   i) State the expression for thermal stress in a bar whose ends are perfectly rigid.

   ii) What does the term 'complementary shear' signify?

   iii) Differentiate between various types of supports.

   iv) State various conditions for equilibrium of a body.

   v) What is Neutral Axis and Neutral Plane?

   vi) State the main assumption while deriving the general formula for bending stress.

   vii) Explain clearly the terms 'shearing force' and 'bending moment' giving suitable examples.

   viii) What is a Column? Differentiate it from strut.

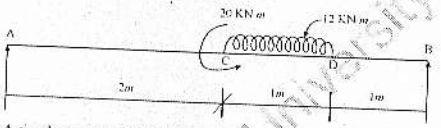
   ix) List various theories of failure.

   x) What is 'torsional rigidity'?

SECTION-B

2. Derive expression for total elongation of a conical bar due to its own weight, when the bar is fixed its upper end and is hanging freely at its lower end.

3. A beam of as shown below is acted upon by loads and a moment. Draw BMD and SFD for the beam.



4. A simply supported beam of span 3.6m has to resist a shear force of 120 KN. The cross section of the beam is a T-section with flange width of 120mm, web and flange thicknesses of 16mm each and overall depth of 160mm. Determine the maximum shear stress induced in the beam and draw the shear stress distribution for the beam section. (5)

5. A hollow steel circular shaft transmits 200KW of power at 150 rpm. The angle of twist in a length of 5m of shaft is 4 degree. Find the inner and outer diameters of the shaft if the permissible shear stress is 60MPa and modulus of rigidity is 80GPa (5)

6. Discuss the various theories of elastic failure with the help of comparative graphic representation. (5)

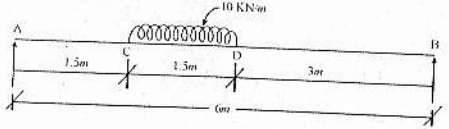
SECTION-C

7. A beam ACDB is simply supported at ends A & B is loaded as shown in fig. Taking E = 2×10^5 N/mm^2 and I = 8000 cm^4 ; Determine

   a. deflection at mid span

   b. max. Deflection and

   c. slope at end A.

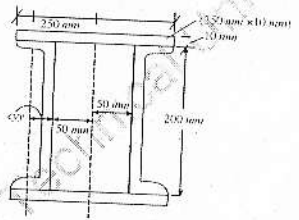


8. A column section is made up of two channels ISMC 200 @22.1kg/m, placed back to back, at a distance of 100 mm, with two flange plates of size 250 mm×10 mm, arranged as shown in Fig. The column is 5 m long, and has its both ends hinged. Determine the safe load which the column can carry. Take f_y = 250 N/mm^2 and E = 2×10^5 N/mm^2. Each channel has the following properties :

   I_{xx} = 1819.3 × 10^4 mm^4 ; I_{yy} = 140.4 × 10^4 mm^4

   a = 2821 mm^2 ; h = 200 mm , b = 75 mm

   Distance of centroid, from web = C_{yy} = 21.7 mm



9. In a two dimensional problem the stresses at a point are σ_x = 100 MPa, σ_y = 60 MPa. If the principal stress is limited to 150 MPa, find out the value of shear stress τ_{xy}. Also find the inclination of the principal plane and magnitude of the maximum shear stress.