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Total No. of Questions : 09

B.Tech.(ME) (2011 onwards) (Sem.–4)

STRENGTH OF MATERIALS-II

Subject Code : BTME-401

Paper ID : [A1211]

Max. Marks : 60

Time : 3 Hrs.

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 :

(a) Define : (i) proof resilience (ii) modulus of resilience.

(b) What is energy of dilation?

(c) What is the necessity of a theory of failure?

(d) For which type of materials is the Tresca theory applicable?

(e) Differentiate between the closed and open coiled helical springs.

(f) Write expressions for the principal stresses in case of a thin sphere subjected to internal fluid pressure.

(g) State the type of stresses in a thick cylinder subjected to internal pressure.

(h) With the help of neat sketch show where does the neutral plane lie incase of a bar with large initial curvature.

(i) What is a centre of twist? Why is it called so?

(j) What is the disc of uniform strength?

SECTION-B

2. Derive expression for strain energy stored in a hollow circular shaft subjected to torsion.

3. Discuss in detail the yield locus and yield surface for the following theories of failure :

   a) Rankine's theory

   b) Tresca theory.

4. A thin spherical shell of diameter 600 mm and thickness 3 mm is full of water. It is then subjected to an internal pressure by pumping in additional 60000 mm^3 of water. Determine now the internal pressure, if for the shell material, E = 200 GPa, V = 0.3 and bulk modulus of water is 2GPa.

5. A thick cylinder with internal and external diameters 100 mm and 200 mm respectively is subjected to simultaneous internal pressure of 30 MPa and external pressure of 15 MPa. Calculate maximum tensile and compressive hoop stresses in the cylinder.

6. A thin disc of uniform thickness with central circular hole rotates at constant velocity about an axis through the centre and perpendicular to the disc. Derive expressions for the radial and circumferential stresses developed.

SECTION-C

7. A closed coiled helical spring is to be made from steel wire of 5 mm diameter. Find the mean coil diameter and the number of turns if the spring is to have an axial stiffness of 5 kN/m and angular stiffeners of 0.1 Nm/deg. Take E = 200 GPa and G = 80 GPa for the spring material.

8. A ring is subjected to diametral pull. Derive expression for the maximum bending moment produced.

9. A 300 mm × 100 mm I-section R.S.J. is subjected to a shearing force of 100 kN. Thickness of web = 6 mm, thickness of flanges = 6 mm. Calculate :

   a) the value of transverse shear stress at neutral axis and at the top of the web,

   b) the percentage of shearing force carried by web.