

Roll No.

Total No. of Pages : 02

Total No. of Questions : 09

B.Tech. (ME-2011 Batch) (Sem.-4th)

STRENGTH OF MATERIALS-II

Subject Code : BTME-401

Paper ID : [A1211]

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. Answer briefly :**

- (a) What is Tresca's theory of failure ?
- (b) Which theory of failure is most suitable for brittle materials ? Give reasons.
- (c) What is a flat spiral spring ?
- (d) What is hoop stress ?
- (e) Which is the most suitable section for a crane hook ? Why ?
- (f) State any two assumptions made in the analysis of curved beams.
- (g) Define the term modulus of resilience.
- (h) Briefly explain the difference in the behaviour of thin and thick cylindrical shells.
- (i) State Maxwell's reciprocal theorem.
- (j) What do you mean by a disc of uniform strength ?

SECTION-B

2. Explain the behaviour of a bar subjected to
 - (a) suddenly applied load
 - (b) an impact load.

3. A quarter elliptical spring is to be 900 mm long and carry a load of 20 kN. The bending stress is limited to 300 MPa and the deflection to 75 mm. Find the suitable width and number of plates required if the width is eight times the thickness. $E = 200 \text{ GPa}$.
4. Explain why no single theory of failure can satisfy all the materials ?
5. In a cast iron body, the principal stresses are 100 MN/m^2 tension and -100 MN/m^2 compression. The elastic limit stresses in tension and compression are 80 MN/m^2 and 400 MN/m^2 respectively. Using principal stress theory, find the factors of safety.
6. A steam turbine rotor is to be designed so that the maximum stresses are to be the same and constant throughout. The rotor is 90 MN/m² when running at 4000 rpm. If the radius is 20 mm, what is the thickness at a radius of 100 mm if the material has a density of 7800 kg/m^3 .

SECTION-C

7. A close-coiled helical spring is to have a stiffness of 10 N/mm with a maximum load of 45 N and a maximum shear stress of 120 N/mm^2 . The solid length of the spring is 100 mm. Find the rigidity of the spring material as $0.4 \times 10^5 \text{ N/mm}^2$.
 - (a) Wire diameter
 - (b) Mean coil radius
 - (c) Number of coils
8. A thin spherical shell 1 m in diameter and 1.2 mm thick is filled with a fluid at atmospheric pressure. What is the increase in volume developed in it if 175 cm^3 more of fluid is pumped in. The circumferential stress at that pressure and $E = 200 \text{ GN/m}^2$, $1/m = 0.3$.
9. Sketch the distribution of shear stress across the following cross-sections :
 - (a) T-section
 - (b) Circular section.

