

Roll No.

3208

**B. Tech. 5th Semester (ME)
Examination – December, 2022**

SOLID MECHANICS

Paper : PCC-ME-303-G

Time : Three hours] Maximum Marks : 75

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt *five* questions in all selecting *one* question from each Unit. Question No. 1 is **compulsory**. All questions carry equal marks.

1. Describe the following : 2.5 × 6 = 15
- (a) Strain energy under pure shear
 - (b) Unsymmetrical bending
 - (c) Section modulus of rectangular bar
 - (d) Wire wound thick cylinder
 - (e) Maxwell reciprocal theorem
 - (f) Centrifugal stress

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UNIT - I

2. Derive the expression for stresses due to following conditions : 15
- (a) Gradually applied load
 - (b) Suddenly applied load
 - (c) Impact or shock loading
3. A simply supported beam of 4 m length having a uniformly distributed load of 5 kN/m over whole span. Find the strain energy stored in beam under uniformly distributed load. Take $E = 200 \text{ GPa}$ and $I = 1200 \text{ cm}^4$. 15

UNIT - II

4. Explain the following terms in details : 15
- (a) Shear centre and flexural stress
 - (b) Product of inertia
 - (c) Ellipse of inertia
5. An open coil helical spring is having 15 coils, mean coil diameter 50 mm and wire diameter 10 mm the helix angle is 30° . The axial deflection due to axial load is 15 mm determine the axial load. Also find bending stress and shear stress due to axial load. Determine the value of axial twist due to which a bending stress produced is 60 MPa. Take $E = 200 \text{ GPa}$ and $G = 80 \text{ GPa}$. 15

3208-1900-(P-3)/(Q-5)/(Z2) (2)

UNIT - III

6. A thick spherical shell of 130 mm internal radius and 60 mm thick is subjected to an internal pressure of 10 MPa. Determine the variation of hoop and radial stresses in the shell. Also find the increase in internal and external radii. Take $E = 210 \text{ GPa}$ and poisson ratio = 0.25. 15
7. Drive an expression to find out maximum radial stress and maximum hoop stress for hollow rotating disc 15

UNIT - IV

8. Derive an expression for stress analysis of bars with large initial radius of curvature. 15
9. Derive expression for link radius for following sections : 5 - 5 - 5 = 15
- (a) Circular section
 - (b) T-section
 - (c) I-section

3208-1900-(P-3)/(Q-5)/(Z2) (3)