

Roll No. ....

**24476**

**B. Tech. 7th Sem.**

**(Mechanical Engineering) VII**

**Examination – December, 2013**

**Strength of material - II**

**Paper : ME - 401 - F**

**Time : Three hours ]**

**[ Maximum Marks : 100**

*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 :** Question No. 1 is compulsory. Attempt any five questions in total, at least one from each section.

1. (a) What is strain energy and impact loading ? 5
- (b) Define the product of inertia & moment of inertia. 5
- (c) Define the radial and hoop stress. 5
- (d) What is leaf spring & flat spiral spring ? 5

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## SECTION – A

2. Drive the expression for strain energy stored in body when load is applied. 20
- (a) Gradually
  - (b) Suddenly
  - (c) Impact.
3. A steel specimen  $1.5 \text{ cm}^2$  in cross section stretches  $0.005 \text{ cm}$  over a  $5 \text{ cm}$  gauge length under an axial load of  $30 \text{ kN}$ . Calculate strain energy stored in the specimen at this point. If the load at the elastic limit for the specimen is  $50 \text{ kN}$ . Calculate the elongation at elastic limit and proff resilience. 20

## SECTION – B

4. Explain the following : 20
- (i) Derivation of Lamé's equation.
  - (ii) Spherical shell subjected to Internal pressure only.
5. A thin spherical shell  $50 \text{ cm}$  in diameter with a thickness  $3 \text{ mm}$  is full of water at atmospheric pressure ( $0.1 \text{ MPa}$ ). Find the Intensity of radial pressure exerted on the wall of the shell is  $30 \text{ c.c.}$  of

water at atmospheric pressure is pumped into the shell. Find out the resulting hoop stress and change in volume of sphere of modulus of elasticity of shell is  $E = 210$  GPa, Poisson's ratio  $\nu = 0.33$ , and bulk modulus of water is 2.361 GPa. 20

### SECTION - C

6. A thick cylinder with internal radius of 8 cm and external radius of 16 cm is subjected to an internal fluid pressure of 80 MPa. Draw the variation of radial and hoop stresses in the Cylinder wall. Also find out the maximum shear stress in the cylinder wall. 20
7. A cylinder of 15 cm internal diameter and 20 cm external diameter is subjected to liquid pressure from inside. There is also a compressive load of 200 kN. applied at the ends of cylinder. Find out the greatest pressure of the liquid so that the maximum stress in the material may not exceed 42 MPa. 20

### SECTION - D

8. A curved bar of rectangular section, initially unstressed is subjected to bending moment of 1500 N-m. Which loads to Straighten the bar. The section is

4 cm. wide by 5 cm deep in the plane of bending and the mean radius of Curvature is 10 cm. Find out the position of the neutral axis and the magnitudes of the greatest bending stress and draw a diagram to show approximately how the stress varies across the section. 20

9. A railway wagon weighing 65 kN and moving with a speed of 10 km/hr is to be stopped by 4 buffer springs in which the maximum compression allowed is 20 cm. Calculate the number of turns in each spring in which diameter of the wire is 2 cm and that of coil is 20 cm.  $G = 84 \text{ GPa}$ . 20