Total No. of Questions : 7] [Total No. of Printed Pages : 2

Roll No. .....

MVSE–102

M. Tech. (Structures) (First Semester) EXAMINATION, Jan.-Feb., 2008

STRENGTH OF MATERIAL AND THEORY OF ELASTICITY

(MVSE–102)

Time : Three Hours

Maximum Marks : 100

Minimum Pass Marks : 40

Note : Attempt any *five* questions. All questions carry equal marks.

1. (a) Describe isotropy, continuity and homogeneity. 5
   (b) Derive equilibrium equations of theory of elasticity. 15

2. (a) Describe stress tensor.
   (b) Find the expressions for body forces distribution necessary to satisfy the equations of equilibrium considering the following stress field : 15

$$\sigma_x = 80x^3 + y$$

$$\sigma_y = 100(x^3 + 10)$$

$$\sigma_z = 10(9y^2 + 10z^3)$$

$$\tau_{xy} = 100(1 + y^2)$$

$$\tau_{yz} = 0$$

$$\tau_{zx} = x(z^3 + 100xy)$$

components for plane stress can be obtained by replacing 'E' by $E/(1 - \nu^2)$ and ν by $\nu/(1 - \nu)$.

4. If 'a' and 'b' are inner and outer radii of the cylinder and p_i and p_0 are uniform internal and external pressure, derive stress component σ_r and σ_θ and show that $\sigma_r + \sigma_\theta$ is constant through the thickness of wall of the cylinder.

5. What is the effect of a circular hole on stress distribution on a plate subjected to tension of magnitude 'S' in x-direction ? Using Saint Venant's principle show that the change in stress distribution is negligible at distances which are large compared to the radius of hole.

6. Draw a cube and show state of stress at a point for a three-dimensional elastic system with usual notations and proper conventions. Establish equation of equilibrium in Cartesian co-ordinate system.

7. The state of stress (N/mm^2) at a point is given by :

$\sigma_x = 200$	$\sigma_y = -100$
$\sigma_z = 50$	$\tau_{xy} = 40$
$\tau_{xz} = 60$	$\tau_{yz} = 60$

Determine the strain component.

Take $E = 2 \cdot 05 \times 10^5$ N/mm^2 and $G = 0 \cdot 8 \times 10^5$ N/mm^2.

8. Write short notes on the following :
   (i) Solution of torsional problems
   (ii) Torsion of rolled sections
   (iii) Membrane analogy
   (iv) Torsional flexural buckling and torsional buckling