Roll No ....

MVSE - 102

M.E./M.Tech. I Semester

Examination, December 2014

Strength of Material and Theory of Elasticity

Time : Three Hours

Maximum Marks : 70

Note: Attempt any five questions. All questions carry equal marks. Assume missing data if any.

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1. a) Given state of stress at a point:

$$\sigma = \begin{pmatrix} xy^2 & xy(3+z) & yz^2 \\ xy(3+z) & y^2(3x-z^2) & x^2y^2z^2 \\ yz^2 & x^2y^2z^2 & yz^3+y \end{pmatrix}$$

Obtain body force distribution at $(1, 1, 1)$ so that the continuum is in equilibrium.

   b) Differentiate between plane stress and plane strain problems.

2. Write notes on the following:

   a) Solution by polynomials.

   b) Two dimensional problems in rectangular coordinates.

   c) Saint-Venant's principle.

3. Explain the importance of using polar coordinate system. Derive equilibrium equation and compatibility in polar coordinates.

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4. a) Derive the expression for pure bending of prismatic bars.

   b) In a three dimensional problem in elasticity, derive differential equations of equilibrium.

5. a) What do you understand by membrane analogy? How it is useful in torsional analysis.

   b) Derive expressions for shear stress, angle of twist and twisting moments in case of a thin rectangular section.

6. a) Explain the use of stress function for the solution of two dimensional problems.

   b) Derive the expression for the bending of a curved bar in polar coordinate system.

7. a) Derive strain compatibility equations.

   b) Write a detailed note on torsion of rolled section.

8. Write notes on the following:

   a) Boundary conditions

   b) Bending of beams

   c) Anisotropic and Isotropic material

   d) 2D problems in Fourier series.

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