



Reg. No. :

Name :

First Semester M.Tech. Degree Examination, March 2013
(2008 Scheme)
(Mechanical – Machine Design)
MDC – 1003 : MECHANICS OF MATERIALS

Time : 3 Hours

Max. Marks : 100

- Instructions :** 1) Answer any five questions.
2) All questions carry equal marks.

1. a) Explain plane stress conditions with a suitable example.
b) The state of stress at a point is given by $\sigma_x = 150$ MPa, $\sigma_y = -110$ MPa, $\sigma_z = 40$ MPa, $\tau_{xy} = 35$ MPa, $\tau_{yz} = 40$ MPa and $\tau_{xz} = 50$ MPa. Determine the strain components, if $E = 2 \times 10^5$ MPa and $G = 0.78 \times 10^5$ MPa.
2. a) Investigate what problem of plane stress is solved by the stress function $\Phi = - (F / d^3) \cdot (xy^2) \cdot (3d - 2y)$.
b) Explain stress transformation equation.
3. a) Given the state of stress at a point in a loaded continuum as :

$$[\sigma] = \begin{bmatrix} 9 & 6 & 3 \\ 6 & 5 & 2 \\ 3 & 2 & 4 \end{bmatrix} \text{ MPa} . \text{ Determine the principal stresses and principal directions.}$$

- b) Derive the general stress function condition for plane strain case including body force.



4. a) Describe membrane analogy concept for torsion problems.
b) A shaft of elliptical cross section having semi major axis 80 mm and semi minor axis 40 mm is subjected to a torque of 589 Nm. Calculate the maximum shear stress generated in the shaft.

 5. a) Describe the propagation of waves in elastic solid media and obtain expressions for waves of dilatation.
b) Explain about the contact stress occurring between two cylindrical bodies.

 6. a) Describe about the stress concentration factor in a plate with a hole subjected to axial stress.
b) Derive the membrane equation for a thin spherical shell.
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