R09

Code No: C7603

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH I SEMESTER EXAMINATIONS APRIL/MAY-2012
CONTINUUM MECHANICS
(AEROSPACE ENGINEERING)

Time: 3hours **Max.Marks:60**

Answer any five questions
All questions carry equal marks

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1.a) Establish the following identity using the index notation:

div (**A** x **B)** = ∇ x **A . B** - ∇ **x B . A**

b) For an arbitrary second order tensor **S**, determine the expression for ∇ x **S**.

2. Derive the expressions for the components of Green – Lagrange strain tensor in cylindrical coordinate system.

3. The components of a stress dyadic at a point, referred to the Cartesian system, are

$$[\sigma] = \begin{bmatrix} 16 & 12 & 0 \\ 12 & -16 & 0 \\ 0 & 0 & 8 \end{bmatrix} MPa$$

Find the principal stress and the principal plane associated with the maximum stress.

4. Derive the energy equation for one-dimensional flow.

5. Derive the Newtonian constitutive equation for stress tensor in a fluid motion.

6. Derive Michell's equations for an elastic system.

7. Derive the Navier – Stokes equations in Cartesian coordinate system.

8. Write short notes on
   a) Maxwell element
   b) Creep response
   c) Kelvin – Voigt element.

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