NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

DEPARTMENT OF MECHANICAL ENGINEERING

B.Tech.(Eight Semester)

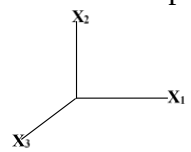
Mid-Term Examination – April 2019

Theory of Elasticity (MEC ~ 803)

[Total No. of Questions: 3] [Total No. of Printed Pages: 1]

Max. Marks: 30 **Duration: 1 ½ hour**

All questions are compulsory

Q.1 (a)	Differentiate between Plane Stress and Plane Strain Problems.	**3**	
(b)	The Component of a first and second order tensor in a particular coordinate frame are given by $\begin{bmatrix} 2 & 0 & 0 \\ 0 & 3 & 4 \\ 0 & 4 & -3 \end{bmatrix} \begin{pmatrix} 2 \\ 5 \\ 4 \end{pmatrix}$  Determine the component of the vector and matrix in a new coordinate system found through a 45^o ($\pi/4$) rotation about the x_2 axis. Choose a counterclockwise rotation when viewing down the negative x_2 axis.	**7**	**C01**
Q.2 (a)	Define surface and body forces. Derive the equation of equilibrium in three dimensions.	**1+2**	**C02**
(b)	By means of strain rosette, the following strains were recorded during the test on a structural member $\varepsilon_0 = -13\text{x}10^{-6}$, $\varepsilon_{45} = 75\text{x}10^{-6}$, $\varepsilon_{90} = 13\text{x}10^{-6}$ Determine the magnitude of the principal stresses if elastic modulus, E = 200GN/m^2 and Poisson ratio, $\mu = 0.3$	**7**	**C01**
Q.3 (a)	State whether the following are Airy's stress function or not (i) $\phi = Ax^2 + By^2$ (ii) $\phi = Ax^3$ (iii) $\phi = A(x^4 - 3x^2y^2)$	**3**	**C02**
(b)	Given the stress function, $\varphi = (H/\pi) y \tan^{-1}(x/y)$. Determine whether stress function ϕ is admissible. If so determine the stresses.	**4+3**	