Total No. of Questions – [04] Total No. of Printed Pages: 01

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OCTOBER 2019 / INSEM (T1)
F. Y. M. TECH. (STRUCTURES) (SEMESTER - I)
COURSE NAME: THEORY OF ELASTICITY
COURSE CODE: CVPB11181
(PATTERN 2018:R1)

Time: [1 Hour] [Max. Marks: 20]

(*) Instructions to candidates:

1) Answer Q.1 OR Q.2, Q.3 OR Q.4
2) Figures to the right indicate full marks.
3) Use of scientific calculator is allowed
4) Use suitable data where ever required

Q.1) Derive the equilibrium equations for a three dimensional stress system subjected to direct stress (σ) and shearing stress (τ) [10 marks]

OR

Q.2) a) An elastic body under the action of external forces has the displacement field given by [4marks]

$D= (2x^2+y^2)\, i + (5z-y)\, j + (3x+y^2)\, k$

Evaluate the component of strain at a point (3,1,2)

Q.2) b) Determine whether the following stress components satisfy equilibrium equations or not, at the point (1,-1, 2). If not, determine the suitable body force required at this point so that these stress components are under equilibrium. [6 marks]

$\sigma_x = 3xy^2z+2x$ $\sigma_y=5xyz+3y$ $\sigma_z= x^2y+y^2z$

$\tau_{xy}=0$ $\tau_{yz}= \tau_{xz}= 3xy^2z+2xy$

Q.3) a) The components of strain at a point in a body are as follows: [4 marks]

$\epsilon_x = C_1 (x^2+y^2) z$ $\epsilon_y = x^2z$ $\gamma_{xy}= 2\, C_2xyz$

where C_1, C2 are constants. Check whether the strain field is compatible one?

Q.3) b) Following are the principal stress at a point in a stressed material. Taking E=210 KN/mm^2 and $\mu = 0.3$, calculate the volumetric strain and Lame's Constant. [6 marks]

$\sigma_x = 200$ N/mm^2, $\sigma_y= 150$ N/mm^2 and $\sigma_z= 120$ N/mm^2

OR

Q.4) Derive Beltrami-Michell compatibility equations for Plane Stress Problem. [10 marks]