Ref. No.: Ex/CE/PE/B/T/415B/2024(S)

B.E. CIVIL ENGINEERING FOURTH YEAR FIRST SEMESTER SUPPLEMENTARYEXAM 2023

Subject: ADVANCED SOLID MECHANICS

Full Marks:100 **Time: 3hours**

(Use Separate Answer scripts for each Part)

Part- I (Marks 50)

1. Derive the equilibrium equations and strain compatibility equations (Saint Venant equation) for plane stress problem. 20
2. Starting from anisotropic material, show that the independent elastic constants for isotropic material are only two. 30

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Part II

Instructions : Use Separate Answer scripts for each part

Question 1. Develop the expression for safe design criteria for ductile material as per 3-D Distortion Energy Theory. Also plot the safe zone as per Distortion Energy Theory for 2-D stress state. (15)

Question 2. The stress tensor components at a point in a continuum are $\sigma_{11} = 6$, $\sigma_{22} = 6$, $\sigma_{33} = 8$, $\sigma_{12} = \sigma_{21} = -3$, $\sigma_{13} = \sigma_{23} = 0$ (MPa). Find the principal stresses, maximum shear stress and octahedral stress at the point. (10)

Question 3. Obtain the governing equation in terms of Airy's Stress Function to analyse a rectangular plate of size L x B with a hole of radius 'a' at the center and subjected to an uniaxial load applied along the side B.

(25)