

Total No. of Questions : 8]

SEAT No. :

P5285

[5562]-137

[Total No. of Pages : 2

M.E. (Civil-Structures)

**THEORY OF ELASTICITY AND PLASTICITY
(2017 Pattern)**

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 and Q.7 or Q.8.*
- 2) *Neat diagram must be drawn wherever necessary.*
- 3) *Figures to the right bracket indicate full marks.*
- 4) *Assume suitable data, if necessary and clearly state*

Q1) a) The state of stress at a point is given by $\sigma_x = 20\text{MPa}$, $\sigma_y = -10\text{MPa}$, $\sigma_z = 5\text{MPa}$, $\tau_{xy} = 4\text{MPa}$, $\tau_{yz} = 5\text{MPa}$ and $\tau_{xz} = 6\text{MPa}$. If $E = 2 \times 10^5 \text{ N/mm}^2$ $G = 0.84 \times 10^5 \text{ N/mm}^2$. Determine the strain components. **[5]**

b) Explain in brief plane stress and plane strain problems. **[4]**

OR

Q2) a) Derive the strain displacement relationship for 3D elasticity problem. **[5]**

b) Write a short note on Airy's Stress Function Method. **[4]**

Q3) a) A spherical container of inner radius 'a' and outer radius 'b' subjected to internal pressure P_1 and external pressure P_o . Determine radial stress component and hoop stress component at a point. **[5]**

b) Derive the torsion equation of prismatic non circular bar subjected to torque 'T' according to St.Venant's theory. **[4]**

OR

Q4) a) Derive the stress displacement relations from basic equation of Axisymmetric problem for circular rotating disc. **[5]**

b) Give a detailed account of prandtl's membrane analogy explaining the principle of analysis of a thin walled member under torsion. **[4]**

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Q5) a) Discuss in detail about the various failure theories of plasticity with its limitation. [8]

b) Explain in brief about Rankine's maximum principle stress theory. [8]

OR

Q6) a) Explain in brief Tresca's and Von-Mises-Henky's yield criteria. [8]

b) When plasticity model is said to be isotropic hardening? Explain with example. [8]

Q7) a) Explain the successive stages in plastic yielding of rectangular beam. [8]

b) Derive the expression for solid cylindrical bar under torsion as per Nadai's Sand Heap analogy. [8]

OR

Q8) Derive the expression for radial and hoop stresses of a elasto-plastic thick spherical shell subjected to internal pressure. [16]

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