Total No. of Questions : 6] **SEAT No. :**

P3928 **[Total No. of Pages : 2**

[4760] - 55

M.E. (Civil) (Structures)

THEORY OF PLASTICITY

(2008 Pattern) (Open Elective - IV)

Time : 4 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any 2 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***All questions carry equal marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Derive Saint Venant's strain compatibility conditions for 3D elasticity problem. **[10]**

b) Derive the strain displacement relationship for 3D elasticity problem. **[10]**

c) Explain in brief plane stress and plane strain problems. **[5]**

Q2) a) Explain in brief Tresca's and Von-Mises-Hencky's yield criteria. **[10]**

b) Explain uniqueness and stability postulates. **[10]**

c) Let us consider that a metal with a yield stress of 280 MPa is subjected to a stress state with principal stresses of 300 MPa, 200 MPa and 50 MPa. Will the metal yield based on the Tresca yield criterion? **[5]**

Q3) a) Explain The von-Mises yield criterion. **[10]**

b) A thick cylinder of internal radius 15 cm and external radius 25 cm is subjected to an internal pressure 'p' MPa. If the yield stress for the cylinder material is 220 N/mm^2, determine (i) the pressure at which the cylinder will start yielding just at the inner radius (ii) the stresses when the cylinder has a plastic front radius of 20 cm. Assume Von-Mises yield condition and state of plane strain. **[15]**

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SECTION - II

Q4) a) When a plasticity model is said to be isotropic hardening? Explain with example. **[10]**

b) Explain the successive stages in the plastic yielding of rectangular beams **[10]**

c) Explain in brief Prager's and Zieglerl's kinematic hardening model. **[5]**

Q5) a) Derive the equations of radial (σ_r) and transverse (σ_θ) stresses for the section of wide plate subjected moments at the ends. **[15]**

b) Explain the theorems of limit analysis. **[10]**

Q6) a) Explain various types of elements used in the finite element method with applications. **[10]**

b) Explain incremental methods of determining limit load. **[15]**

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