Total No. of Questions : 6]

SEAT No. :

P4193

[Total No. of Pages : 2

[4960]-54
M.E. (Civil Structures)
THEORY OF PLASTICITY
(2008 Pattern) (Elective - IV)

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

Instructions to the candidates:

1) ***Answer any two 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) ***Figures to the right side indicate full marks.***
5) ***All questions carry equal marks.***
6) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume Suitable data if necessary.***

SECTION - I

Q1) a) A beam of narrow rectangular cross section of unit width simply supported at the ends loaded by its own weight. Find expressions for displacement component *u* and *v*. **[15]**

b) Derive equations of equilibrium for two dimensional elasticity problems in polar coordinates. **[10]**

Q2) a) The state of stress at a point is given by σ_x = 60 MPa; σ_y = 125 MPa; τ_{xy} = 35 MPa. If the yield strength of the material is 120 MPa in a uniaxial tensile test, determine whether yielding will occur according to Tresca's and Von-Mises yield condition or not. **[15]**

b) Write short note on yield surfaces. **[10]**

Q3) a) A thick cylinder of internal radius 20 cm and external radius 30 cm is subjected to an internal pressure '*p*' MPa. If the yield stress for the cylinder material is 230 N/mm^2, determine (a) the pressure at which the cylinder will start yielding just at the inner radius (b) the stresses when the cylinder has a plastic front radius of 25 cm. Assume Von-Mises yield condition and state of plane strain. **[15]**

b) The state of stress at a point is given by, $\sigma_x = 0.60 \times 10^3$ kg/cm^2; σ_y = 1.25 kg/cm^2 and τ_{xy} = 0.3 kg/cm^2. If the yield strength of the material is l.25 kg/cm^2 in a uniaxial tensile test, determine whether yielding will occur according to Tresca's and Von-Mises yield condition or not.**[10]**

P.T.O.

SECTION - II

Q4) a) Write short note on : **[15]**

i) Isotropic hardening model

ii) Kinematic hardening model

b) Explain initial and subsequent yield surfaces in tension. **[10]**

Q5) a) Determine the plastic deformation of the bar if the whole elongation $\Delta l = 0.02m$, the original length of the bar was $l = 3.0m$, assumption is elasto-plastic behaviour of material. E = 210 GPa and f_y = 275 MPa. **[15]**

b) State and explain uniqueness theorems. **[10]**

Q6) a) Explain Tressca's yield condition in plane stress and plane strain. **[10]**

b) Explain the finite element models for plasticity problems. **[15]**