Total No. of Questions : 7]

SEAT No. :

P3868

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[4960] - 1065

M.E. (Mechanical) (Design)

MATERIAL SCIENCE AND MECHANICAL BEHAVIOUR OF MATERIALS

(2013 Pattern) (Semester - I)

Time : 3 Hours] *[Max. Marks :50*

Instructions to the candidates:

1) ***Answer any five questions.***
2) ***All the questions should be solved in one answer book and attach extra supplements if required.***
3) ***Draw Diagrams wherever necessary.***
4) ***Use of scientific calculator is allowed.***
5) ***Assume suitable data where ever necessary.***

Q1) Classify and explain crystalline defects. Discuss the importance of defects on the following material properties - **[10]**

a) Strength

b) Strain Hardening

c) Plastic Deformation

Q2) State of stress at a point in a body is given by $\begin{bmatrix} 235 & 0 & 40 \\ 0 & -65 & 0 \\ 40 & 0 & 35 \end{bmatrix}$ Use Mohr's circle method to determine **[10]**

a) Principal stresses

b) Octahedral normal stress

c) Octahedral shear stress

d) Maximum shear stress.

Q3) Plot yield locus for Tresca criteria for $\sigma_z = 0$. Does it predict failure under hydrostatic stress? **[10]**

P.T.O.

Q4) In a tension test of ductile material specimen, having diameter of 14 mm and gauge length of 50 mm, fractures occurs after substantial necking. The final gauge length is 83 mm and final diameter is 8.0 mm. Determine the correct value of 'true fracture strain' using changes in both length and area. Justify the answer. **[10]**

Q5) An experiment (uniaxial tension test) was conducted on a speciman made from a certain class of steel to determine the hardening behaviour. Two points on a true stress-strain curve are σ = 200 MPa at ε = 0.045 and σ = 300 MPa at ε = 0.145. Find the values of k & n that best fit the data. Then using these values of k & n, predict the true stress at strain of ε = 0.25. **[10]**

Q6) Explain shakedown in thick tubes that occurs in "autofrettage" process using suitable example. **[10]**

Q7) What is viscoelasticity? Explain Voigt-Maxwell model for viscoelastic material with neat sketch. **[10]**