Total No. of Questions : 7]

SEAT No. :

P3906

[Total No. of Pages : 2

[5155]- 156

M.E. (Mechanical) (Design Engineering)
Material Science and Mechanical Behaviour of Materials
(2013 Pattern) (502202) (Semester - I)

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

Instructions to the candidates:

1) ***Answer any Five questions.***
2) ***Neat diagrams must be drawn whenever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data whenever necessary.***

Q1) A plate of iron is exposed to a carburizing (carbon-rich) atmosphere on one side and a decarburizing (carbon-deficient) atmosphere on the other side at 700ºC. If a condition of steady state is achieved, calculate the diffusion flux of carbon through the plate if the concentrations of carbon at positions of 5 and 10 mm beneath the carburizing surface are 1.2 and 0.8 kg/m^3, respectively. Assume a diffusion coefficient of 3 x 10^{-11} m^2/s at this temperature. **[10]**

Q2) Explain need of different yield criteria and also explain types of yield criteria, yield surface for ductile and brittle material. **[10]**

Q3) To ensure that the neck in a tensile bar would occur at the middle of the gauge section, the machinist made the bar with a 50 mm. Diameter in the middle of the gauge section and machined the rest of it to a diameter of 50.5 mm. After testing, the diameter away from the neck was 47.0 mm. Assume that the stress-strain relation follows the power law, equation $\sigma = K\varepsilon^n$ What was the value of n? **[10]**

Q4) a) Explain Torsion test. **[5]**

b) Explain different models of uniaxial behaviour of material in plasticity. **[5]**

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Q5) The fully plastic Simply supported beam for a rectangular beam carry 50% greater bending moment than the maximum safe elastic bending moment-Justify. **[10]**

Q6) Explain factors that affect the yield strength of material. **[10]**

Q7) Compare elasticity and viscoelasticity. **[10]**