

B.Tech. Civil (Construction Management)

Term-End Examination

December, 2016

00982

ET-204(A) : MATERIALS SCIENCE

Time : 3 hours

Maximum Marks : 70

Note : Attempt any **seven** questions. All questions carry equal marks. Use of calculator is permitted.

1. (a) Draw and discuss TTT diagram. 7
(b) Also show the Martempering and Austempering. $2 \times 1 \frac{1}{2}$
2. (a) What is corrosion ? Explain. How does the corrosion process limit the life of the components ? Explain with example. 5
(b) List down the general corrosion protection techniques. Discuss any one of them. 5

3. (a) A piece of copper originally 350 mm long is pulled in tension with a stress of 270 MPa. If the deformation is entirely elastic, what will be the resultant elongation ?
E for copper = 11.0×10^4 MPa. 5
- (b) Discuss the tensile stress – strain behaviour for brittle and ductile materials, with the help of suitable diagrams. 5
4. What is fracture ? Explain the Griffith theory for the above.

$$\text{Derive } \sigma = \left(\frac{2 \gamma E}{\pi a} \right)^{1/2}.$$

Here

σ = Stress

γ = Surface energy

E = Modulus of elasticity

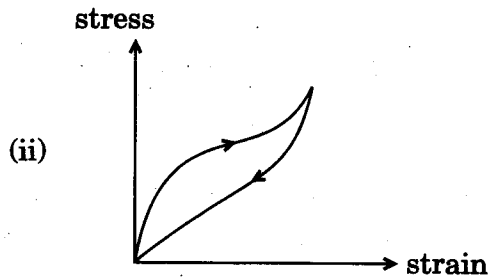
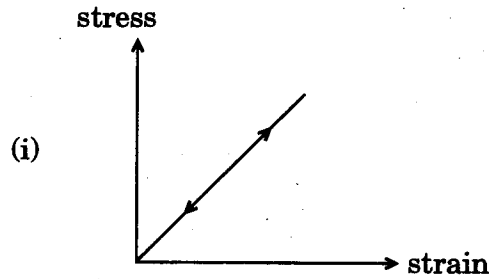
2a = Length of long axis

Give the assumptions also. 10

5. Explain briefly all **four** of the following : $4 \times 2 \frac{1}{2} = 10$

- (a) Electron Hopping
(b) Ionic Conduction
(c) Activation Energy
(d) Meissner Effect

6. (a) Write down the correct condition for the following stress – strain curves : 5



- (b) Define the following : 5
- (i) Stress at a point
 - (ii) Body forces

7. Explain the following with the help of examples : $2 \times 5 = 10$

- (a) Principle of X-ray Diffraction
- (b) Neutron and Electron Diffraction

8. Define any *five* of the following : 5×2=10

- (a) Van der Waals Bond
- (b) Pauli Exclusion Principle
- (c) Fermi Level
- (d) Covalent Bond
- (e) Energy Band Gap
- (f) Hybrid Orbital
- (g) Bragg Diffraction

9. (a) Can the same material exist in crystalline and amorphous form ? Give some examples.
How many atoms of silicon are there in a chunk of silicon weighing 0.5 kg ? 2+3
- (b) Give the general classification of metals. 5

10. Define and draw the following : 5×2=10

- (a) Point Defect
 - (b) Vacancy Defect
 - (c) Edge Dislocation
 - (d) Screw Dislocation
 - (e) Mixed Dislocation
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