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ET-204(A)

00342

B.Tech. Civil (Construction Management)

Term-End Examination

June, 2013

ET-204(A) : MATERIALS SCIENCE

Time : 3 hours *Maximum Marks : 70*

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

1. (a) Define direction index (uvw) in a cubic crystal. How is family of directions having same indices represented ? If a plane and a line have same indices, how are they related. Show (1 1 1), (1, 1, 0) and $(\bar{1}\ \bar{1}\ 0)$ directions in cubic crystal. 7

   (b) Define planer and linear atomic density of a crystalline structure. 3

2. (a) Describe three types of bonds that occur between atoms. Explain the effects of bonds on properties of material. 7

   (b) Calculate packing factor of simple cubic lattice. 3

3. (a) How do you classify steels ? What are the applications of medium carbon and high carbon steels ? Give examples. 5

(b) What is meant by Stainless steel ? What are its types ? Give three examples of application of stainless steel. 5

4. Draw iron-carbon phase diagram and show various phases where they exist. 10

5. Describe following heat treatments which can be given to steel. 10

(a) Annealing

(b) Hardening

(c) Tempering

How do these treatments affect properties ? Illustrate with examples.

6. (a) Describe the types of defects in crystalline structure. Which defect helps plastic deformation ? What can be done to reduce its effect so that plastic deformation requires high stress and thus strength of crystalline structure is increased ? 6

(b) On stress strain diagram show yielding in mild steel specimen. Why does yielding occur ? 4

7. (a) Define thermal conductivity and give its units. How does thermal conductivity of pure metal depend upon temperature. Show the conductivity variation of Ag, Cu and Al between 0 and 300°C. 5

(b) What is a refractory material and where is it used ? Name the chemical compounds which are refractory materials. 5

8. (a) What is resistivity of an electrical conductor ? What factors affect the resistivity ? Show the variation of resistivity as the temperature increases. 5

(b) What is an extrinsic semi conductor ? Distinguish between p - type and n - type extrinsic semi conductors. 5

9. (a) Distinguish between solid solution hardening and precipitation hardening. 5

(b) A steel rod of diameter 20mm and guage length of 40mm is pulled by a force of 8 kN The increase in guage length is recorded as 0.00 485mm. Calculate modulus of elasticity of steel. 5

10. (a) Why it is difficult to weld austenitic stainless steel (18% Cr, 8%Ni, 0.08%C) ? What defect is produced in weld region ? 5

(b) Show three arrangements of macromolecules in a polymer. Which arrangement is good for strength ? The three arrangements are : 5

(i) Amorphous

(ii) Crystalline in amarphous matrix

(iii) Oriented crystalline.