

Marks scored:

KATHMANDU UNIVERSITY
End Semester Examination [C]
July, 2017

Level : B. E.

Year : II

Exam Roll No. :

Time: 30 mins.

Course : MEEG 213

Semester: I

F. M. : 10

Registration No.:

Date : JUL 06 2017

SECTION "A"

[20 Q. × 0.5 = 10 marks]

Cross mark [X] the most appropriate answer.

1. What is the effect of high temperatures on material properties?
 loss of cohesive strength increase in stiffness
 increase in hardness all of the above
2. What is the effect of temperature on stiffness of a metal?
 Temperature has no effect on stiffness of metal
 as temperature increases stiffness of metal decreases
 as temperature increases stiffness of metal increases
 none of the above
3. Which of the following statements is true?
 Ceramic materials have low melting point
 Porcelain is used as insulating material in spark plugs
 Graphite is viscoelastic in nature
 Compacting iron oxide powder ceramic tools are prepared
4. When are the slip lines observed?
 after plastic deformation before plastic deformation
 after mechanical working after annealing
5. What is meant by Frenkel defect?
 defect in which interstitial position is occupied by missing atoms
 defect in which positive and negative ions are missing
 defect in which interstitial position is occupied by extra atom in the crystal without disorganizing the parent atom
 none of the above
6. What is meant by work hardening process?
 Ductile materials are deformed plastically at temperatures below crystalline temperatures which increase strength and hardness of the material
 Ductile materials are deformed plastically at temperatures above crystalline temperatures which increase strength and hardness of the material
 Ductile materials are deformed plastically at crystalline temperatures which increase strength and hardness of the material
 None of the above

7. Specify the sequence correctly
 Grain growth, recrystallization, stress relief
 Stress relief, grain growth, recrystallization
 Stress relief, recrystallization, grain growth
 Grain growth, stress relief, recrystallization
8. Eutectic product in Fe-C system is called
 Pearlite Bainite Ledeburite Spheroidite
9. A solid phase results in a solid plus another solid phase up on cooling during _____ reaction.
 Eutectoid Peritectoid Eutectic Peritectic
10. Gibbs phase rule for general system is
 $P+F=C-1$ $P+F=C$ $P+F=C-2$ $P+F=C+2$
11. A steel containing Cementite is
 Hard Hard and ductile Soft and Brittle Hard and brittle
12. Not a characteristic parameter of Ceramics is
 high temperature stability high mechanical strength
 low elongation low hardness
13. Tempering is done to
 Toughen with minimum softening To Harden
 To Soften To Harden with minimum softening
14. Substances in which measured properties are independent of the direction of measurement are?
 anisotropic nonlinear polycrystalline isotropic
15. Which is correct sequence for packing factor for SC, FCC, BCC, HCP crystal?
 0.74, 0.52, 0.68, 0.74 0.52, 0.74, 0.68, 0.74
 0.52, 0.52, 0.68, 0.74 0.74, 0.68, 0.68, 0.52
16. Copper has an atomic radius of 0.128 nm, an FCC crystal structure, and an atomic weight of 63.5 g/mol. Compute its theoretical density.
 8.94 g/cm³ 8.89 g/cm³ 8.15 g/cm³ 9.15 g/cm³
17. Amorphous material is one
 In which atoms align themselves in a geometric pattern upon solidification
 In which there is no definite atomic structure and atoms exist in a random pattern just as in a liquid
 Which is not solidified
 Which emits fumes on melting
18. If a radius of an atom in a simple cubic crystal is r, then the body diagonal of the unit cell is?
 $r\sqrt{3}$ 2r $2r\sqrt{3}$ $2r\sqrt{2}$
19. Which bond has the highest melting points?
 Covalent Ionic Metallic All the above
20. Rapidly quenching the eutectoid steel will result to?
 Pearlite Martensite Spheroidite Cementite

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Level : B. E.
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Time : 2 hrs. 30 mins.

Course : MEEG 213
Semester: I
F. M. : 40

JUL 06 2017

SECTION "B"

[8 Q. × 5 = 40 marks]

Attempt ALL questions. Assume suitable data if necessary. Clean figures and precise answering is recommended.

Q.N.1

- a. Why study of material science is important and how it differs from material engineering?
- b. Write about Biomaterials and Composites.
- c. Explain in short Wave mechanical and Bohr's Atomic model with suitable figures.

[1+2+2]

Q.N.2

- a. Calculate Atomic Packing Factor (APF) for FCC Crystal Structure.
- b. Explain Schottky and Frenkel defects with suitable figures.
- c. Write the procedure for finding Miller Indices.

[2+2+1]

Q.N.3

- a. Iron has a BCC crystal structure, an atomic radius of 0.124 nm, and an atomic weight of 55.85g/mol.
 - i. Calculate APF.
 - ii. Compute theoretical density.
 - iii. Line and planar density
- b. Explain the process of twinning imperfection with suitable examples.

[2+1+1]

[1]

Q.N.4

- a. Explain Binary Phase diagram with suitable example.
- b. With suitable example explain Gibbs Phase Rule.

[2+3]

Q.N.5

For Iron- Iron Carbide System Diagram.

[2+3]

- a. Draw and explain the system of Iron Carbon diagram.
- b. Explain in detail about Eutectoid, Hypo-eutectoid and Hyper eutectoid alloy with the help of Iron Carbon Diagram with details about various microstructural phase transformations.

Q.N.6

- a. What is Heat Treatment Process? List the types.
- b. Explain in detail, Isothermal Transformation Diagram for Steel. Explain in detail about the various transformation products.

[1+4]

Q.N.7

Give a reason:

[1 × 5 = 5]

- a. FCC is a more close packed structure yet solubility of carbon in austenite which is FCC is higher than that in ferrite which is BCC. Why is it so?
- b. Which microstructure in eutectoid steel has maximum hardness? Give reason.
- c. Why grey Cast Iron is called so? Give a reason.
- d. Chromium is alloyed with steel to form Stainless Steel.
- e. What happens by tempering Martensite.

Q.N.8

Write short notes on:

[1 × 5 = 5]

- a. Fatigue and improvement of fatigue life
- b. Griffith Theory
- c. Ferrous and Non Ferrous Alloys
- d. Compare the chemical properties of Ceramics with metals and polymers.
- e. Mechanical properties of Metals