Printed Page:- 03 **Subject Code:- AME0302**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: III - THEORY EXAMINATION DEC (2023 - 2024)

Subject: Materials Science and Engineering

Time: 3 Hours **Max. Marks: 100**

General Instructions:

IMP: *Verify that you have received the question paper with the correct course, code, branch etc.*

1. *This Question paper comprises of* ***three Sections -A, B, & C.*** *It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.*

2. *Maximum marks for each question are indicated on right -hand side of each question.*

3. *Illustrate your answers with neat sketches wherever necessary.*

4. *Assume suitable data if necessary.*

5. *Preferably, write the answers in sequential order.*

6. *No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.*

SECTION-A 20

1. Attempt all parts:-

1-a. The elastic stress strain behavior of rubber is (CO1) 1

(a) Liner

(b) Nonliner

(c) Plastic

(d) No fixed relationship

1-b. Crystal structure of austenite is (CO1) 1

(a) Body centered cubic

(b) Face centered cubic

(c) Hexagonal closed packed

(d) Body centered tetragonal

1-c. Gibb's phase rule is given by (F = no. of DOF, C = no. of components, P = no. of phases) (CO2) 1

(a) F = C + P

(b) F = C + P + 2

(c) F = C - P - 2

(d) F = C - P + 2

1-d. Pearlite consists of (CO2) 1

(a) 6.67% C and 93.33% ferrite

(b) 12% Fe and 87% cementite

(c) 13% C and 87% ferrite

(d) 13% cementite and 87% ferrite

1-e. The lattice diffusion is caused by (CO3) 1

(a) Grain boundaries

(b) Screw dislocations

(c) Point imperfections

(d) Twins

1-f. Which of the following is not a stage of annealing? (CO3) 1

(a) Heating

(b) Soaking

(c) Tempering

(d) Quenching

1-g. Carbon nano tubes are also called as (CO4) 1

(a) Bucky tubes

(b) Bulky tubes

(c) Bulk tubes

(d) Buck balls

1-h. Strong and ductile materials (CO4) 1

(a) Polymers

(b) Ceramics

(c) Metals

(d) Semiconductors

1-i. Which among the following helps us in getting a three-dimensional picture of the specimen? (CO5) 1

(a) Transmission Electron Microscope

(b) Scanning Electron Microscope

(c) Compound Microscope

(d) Simple Microscope

1-j. X-Ray can be deflected by_____ (CO5) 1

(a) Electric field

(b) Magnetic field

(c) Electromagnetic field

(d) None of the fields

2. Attempt all parts:-

2.a. Draw stress-strain diagram for cast iron. (CO1) 2

2.b. What are the four solid phases present in the iron-iron carbide phase diagram? (CO2) 2

2.c. What are the objective of normalizing? (CO3) 2

2.d.	What are the advantages of composite materials. (CO4)	2
2.e.	How SEM is differ from FESEM? (CO5)	2

SECTION-B 30

3. Answer any five of the following:-

3-a.	What are the factors affecting fatigue properties of materials, explain in brief. (CO1)	6
3-b.	Determine the inter planer spacing (2 0 0), (2 2 0) and (1 1 1) planes in FCC crystal having an atomic radius of 1.246A. (CO1)	6
3-c.	What is meant by cold working and hot working of metals? Explain in detail. (CO2)	6
3-d.	What are the characteristics of pearlite and austenite. (CO2)	6
3.e.	Explain the Flame Hardening heat treatment. (CO3)	6
3.f.	What is the difference between the composite materials and the alloy? (CO4)	6
3.g.	What are the informations revealed by the microstructure examination? (CO5)	6

SECTION-C 50

4. Answer any one of the following:-

4-a.	Derive an expression for Atomic Packing Factor in case of FCC unit cell. (CO1)	10
4-b.	Define the following mechanical properties tensile strength, modulus of elasticity, toughness, and hardness. (CO1)	10

5. Answer any one of the following:-

5-a.	Draw the iron-carbon equilibrium diagram and explain it. (CO2)	10
5-b.	What is lever phase rule to determine the mass fraction of the phases present in a binary phase diagram? Also, derive an equation. (CO2)	10

6. Answer any one of the following:-

6-a.	Explain the objective and the procedure of Annealing heat treatment of metals with a neat sketch. (CO3)	10
6-b.	Discuss the need of quenching process.Write the importance of correct quenching media and their types. (CO3)	10

7. Answer any one of the following:-

7-a.	What is piezo electric materials; explain various piezo electric materials and their applications. (CO4)	10
7-b.	What is meant by reinforcement materials? Write about their classification and applications. (CO4)	10

8. Answer any one of the following:-

8-a.	What is meant by Materials characterization? What is X-Ray diffraction? What is the need of X-ray diffraction? Explain in brief. (CO5)	10
8-b.	Explain the transmission electron microscopy with a neat sketch in details. (CO5)	10