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 (2024 - 2025)

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. Which of the following material has non-linear elastic behaviour? (CO1, K1) 1

(a) Mild steel
(b) Aluminium
(c) Copper
(d) Rubber

1-b. How many atoms are there in an HCP crystal structure? (CO1, K1) 1

(a) 8
(b) 4
(c) 6
(d) None of above

1-c. The number of phases present in equilibrium at eutectic point (CO2, K1) 1

(a) 0
(b) 1
(c) 2
(d) 3

1-d. Monal metal is an alloy of (CO2, K1) 1

(a) Iron and carbon
(b) Copper and zinc
(c) Aluminium and copper

(d) Copper and nickel

1-e. A light weight Al-Li alloy suitable for making aircraft structure is obtained. The process involved in this transformation is (CO3, K1) 1

(a) Precipitation hardening
(b) Cyniding
(c) Splat cooling
(d) Flame hardening

1-f. Calcium carbonate is used in the case of (CO3, K1) 1

(a) Hardening
(b) Cyaniding
(c) Tempering
(d) Nitriding

1-g. Detrimental property of a material for shock load applications. (CO4, K1) 1

(a) High density
(b) Low toughness
(c) High strength
(d) Low hardness

1-h. Which of following is not a piezoelectric materials? (CO4, K1) 1

(a) Quartz
(b) Rochelle salt
(c) Barium Titanate
(d) Copper

1-i. Which of the following are true for electron microscopy? (CO5, K1) 1

(a) Specimen should be thin and dry
(b) Image is obtained on a phosphorescent screen
(c) Electron beam must pass through evacuated chamber
(d) Specimen should be thin and dry, image is obtained on a phosphorescent screen and electron beam must pass through evacuated chamber

1-j. X-rays required for industrial applications generally need a voltage of (CO5, K1) 1

(a) 500 V
(b) Below 50 kV
(c) Above 500 kV
(d) Above 50 kV

2. Attempt all parts:-

2.a. Differentiate between crystalline and non-crystalline structure. (CO1, K2) 2

2.b. What are the limitation of cold working of metal? (CO2, K2) 2

2.c. What are the limitations of Fick's laws? (CO3, K2) 2

2.d. What are Biomaterials? (CO4, K2) 2

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2.e.	What are the different material characterization techniques? (CO5, K2)	2

SECTION-B 30

3. Answer any five of the following:-

3-a.	Differences between the following: (CO1, K2) (i) Toughness and resilience, (ii) True stress-strain and engineering stress-strain	6
3-b.	What are the various imperfections in crystals and their effects on properties? (CO1, K2)	6
3-c.	Differentiate between the cold and hot working of metals.(CO2, K2)	6
3-d.	What is meant by the Solid solutions, write the Eutectoid reaction, Eutectoid point and the Eutectoid temperature for plain carbon steel. (CO2, K2)	6
3.e.	Explain the different types of diffusion in solids. (CO3, K2)	6
3.f.	What is the difference between the composite materials and the alloy? (CO4, K2)	6
3.g.	What informations can be revealed from the microstructure examination? (CO5, K2)	6

SECTION-C 50

4. Answer any one of the following:-

4-a.	Explain the fatigue test with a neat sketch and draw a S-N curve. (CO1, K2)	10
4-b.	What is Non Destructive Testing (NDT)? Write the various tests under NDT. Also explain how it differs from Destructive Testing? (CO1, K2)	10

5. Answer any one of the following:-

5-a.	What is Gibb's Phase Rule? Explain in brief. (CO2, K2)	10
5-b.	Write the applications of ferrous and non-ferrous alloy. (CO2, K2)	10

6. Answer any one of the following:-

6-a.	Draw the Time-Temperature-Transformation (T-T-T) diagram and explain in brief. (CO3, K2)	10
6-b.	Explain the objective and the procedure of Normalizing heat treatment of metals with a neat sketch. (CO3, K2)	10

7. Answer any one of the following:-

7-a.	What is piezo electric materials? Explain various piezo electric materials and their applications. (CO4, K2)	10
7-b.	What are the composite materials? How do you classify them? Also, write their applications. (CO4, K2)	10

8. Answer any one of the following:-

8-a.	Explain the X-Ray diffraction technique with a neat sketch in details. (CO5, K2)	10
8-b.	Explain the transmission electron microscopy with a neat sketch in details. (CO5, K2)	10