Roll No: ☐☐☐☐☐☐☐☐☐☐☐☐☐

BTECH
(SEM IV) THEORY EXAMINATION 2023-24
MATERIAL SCIENCE

TIME: 3 HRS   **M.MARKS: 70**

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1.   Attempt *all* questions in brief.   2 x 7 = 14

a.	Define solidus, liquidus and tie line in phase diagram.
b.	State Gibbs phase rule and explain.
c.	Define Creep.
d.	Explain critical cooling rate in heat treatment.
e.	Differentiate between slip and twinning.
f.	Differentiate between diamagnetism and ferromagnetism
g.	Define nanomaterials

SECTION B

2.   Attempt any *three* of the following: 7 x 3 = 21

a.	Discuss the "Hume Ruthery Rule". Define solid solution and Differentiate between interstitial and substitutional solid solution.
b.	Explain Fick's laws of diffusion and derive the Fick's second law
c.	Define fatigue failure and explain SN curve for steel.
d.	Explain insulating, Ferroelectric, superconducting materials and their properties in brief.
e.	Discuss the role of matrix and reinforcement in FRP composite in detail.

SECTION C

3.   Attempt any *one* part of the following: 7 x 1 = 7

(a)	Demonstrate and explain Eutectic, eutectoid, peritectic, peritectoid, reactions with diagram.
(b)	Explain the process of drawing binary phase diagram and derive the expression for phase lever rule.

4.   Attempt any *one* part of the following: 7 x 1 = 7

(a)	Construct Iron –Iron carbide diagram. Interpret the various microstructure of Eutectoid Steels with all invariant reactions.
(b)	Sketch the TTT Diagram and explain the austenite transformation into perlite, benite and martensite.

5.   Attempt any *one* part of the following: 7 x 1 = 7

(a)	Explain the primary, secondary and ternary creep phenomena through creep curve .
(b)	Draw the stress strain curve for ductile and brittle material and explain them.

6.   Attempt any *one* part of the following: 7 x 1 = 7

(a)	Explain domain Theory of Ferro Magnetism
(b)	Explain the polarization mechanism in dielectric materials

7.   Attempt any *one* part of the following: 7 x 1 = 7

(a)	Discuss properties and applications of carbon nanotubes in detail.
(b)	Write short note on following: (1)NiTi Alloy (2) shape memory(3) metallic glasses