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**BTECH**  
**(SEM III) THEORY EXAMINATION 2024-25**  
**MATERIALS ENGINEERING**

TIME: 3 HRS

M.MARKS: 70

Note: Attempt all Sections. In case of any missing data; choose suitably.

## SECTION A

1. Attempt all questions in brief.

2 x 07 = 14

Q no.	Question	CO	Level
a.	Write down the % composition of carbon in steel and cast iron.	1	K2
b.	What is a substitutional solid solution?	1	K2
c.	Write short note on alloys.	2	K2
d.	What is the difference between alloys and composite materials?	2	K2
e.	What is the importance of tie line in phase diagram?	3	K2
f.	What is the difference between annealing and normalizing?	4	K2
g.	Differentiate between NDT and destructive testing.	5	K2

## SECTION B

2. Attempt any three of the following:

07 x 3 = 07

a.	With the help of neat sketch explain different types of crystal structure.	1	K2
b.	Write short note on Hume-Rothery's rule.	2	K2
c.	What is the purpose behind alloying the steels? What are the different types of steels are available and what are their applications? Explain.	3	K2
d.	What is the purpose of heat treatment processes? Explain Austempering and martempering	4	K3
e.	What is Non-Destructive Testing (NDT)? Explain in detail any two NDT methods.	5	K2

## SECTION C

3. Attempt any one part of the following:

07 x 1 = 07

a.	Draw a neat sketch of BCC crystal structure and calculate its atomic packing factor and also find out the effective number of atoms.	1	K4
b.	NaCl structure has FCC structure. The density of NaCl is $2.18 \text{ cm}^3$ . Calculate the distance between two adjacent atoms.	1	K4

4. Attempt any one part of the following:

07 x 1 = 07

a.	Describe various types of micro-constituents of Eutectic Steel (at STP).	2	K2
b.	Difference Between Substitutional and Interstitial Solid Solution	2	K3

5. Attempt any one part of the following:

07 x 1 = 07

a.	Explain the properties of copper and its alloys brass and bronze	3	K2
b.	Discuss the constituents and properties of Nickel based Super alloys.	3	K2

6. Attempt any one part of the following:

07 x 1 = 07

a.	Implement the concept of continuous cooling transformation heat treatment method on eutectoid steel, show it on a diagram and explain why bainite not appears?	4	K3
b.	Why we prefer tempering after hardening? Explain in details.	4	K3

7. Attempt any one part of the following:

07 x 1 = 07

a.	Explain the Material behavior at a very low (Cryogenics) and high temperature with the help of a stress-strain curve	5	K3
b.	Explain the term creep, its mechanism and stages	5	K3