R18

Code No: 153BC

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech II Year I Semester Examinations, February - 2024

MATERIAL SCIENCE AND METALLURGY

(Common to ME, MCT)

Time: 3 Hours **Max. Marks: 75**

Note: i) Question paper consists of Part A, Part B.
ii) Part A is compulsory, which carries 25 marks. In Part A, answer all questions.
iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART – A

(25 Marks)

1.a)	Draw a neat sketch of BCC unit cell and show the atom positions and (100) family of planes.	[2]
b)	What dislocation and explain its significance in a metal?	[3]
c)	Why pearlite microstructure looks like lamellar type?	[2]
d)	What are the allotropic forms of iron?	[3]
e)	What is the end product (phase) of hardening a plain carbon steel?	[2]
f)	Why normalized steel is more stronger than annealed one?	[3]
g)	What is thermo mechanical treatment?	[2]
h)	Distinguish between hardening and hardenability.	[3]
i)	Distinguish between brass and bronze.	[2]
j)	What are maraging steels?	[3]

PART – B

(50 Marks)

2.a)	What are ceramics? Give few examples. Explain its applications.	
b)	What are volume defects? Explain.	[6+4]
	OR	
3.a)	What is critical resolved shear stress? Deduce the expression for critical resolved shear stress.	
b)	Write short notes on metallic bonding.	[6+4]
4.a)	Why alloying is essential?	
b)	What is solid solution? How they are classified? Explain with neat sketches.	[2+8]
	OR	
5.	Draw a binary phase diagram where solute and solvent are soluble in each other in liquid state and completely undissolved in solid state? Explain the cooling behaviour of hypoeutectic alloy from liquid to solid at room temperature quanitatively.	[10]
6.a)	What is spheroidizing? How it is done?	
b)	What is tempering? Why this heat treatment is given?	[6+4]
	OR	

7.a) Explain Isothermal diagrams for hyper eutectoid steel.
b) Why mild steel cannot be hardened? Explain. [6+4]

8.a) Distinguish between surface hardening and case hardening.
b) Explain any two methods of case hardening with respect to process, advantages and limitations. [4+6]

OR

9. Write short notes on the following:
a) Cyaniding
b) Induction hardening. [5+5]

10. Write short notes on the following:
a) Stainless steels
b) Tool steels. [5+5]

OR

11. Briefly explain the classification of titanium alloys giving examples for each type along composition, properties and applications. [10]

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