QP Code: RN23BTECH087 | Reg. No | | | | | | | | | | | AY 23

GANDHI INSTITUTE OF ENGINEERING AND TECHNOLOGY, ODISHA, GUNUPUR
(GIET UNIVERSITY)

B. Tech(Third Semester - Regular) Examinations, November – 2024

23BMEPC23003- Material Science

(Mechanical Engineering)

Time: 3 hrs | Maximum: 60 Marks

Answer ALL questions

(The figures in the right hand margin indicate marks)

PART – A **(2 x 5 = 10 Marks)**

Q.1. Answer ***ALL*** questions		CO #	Blooms Level
a.	Difference between 'ductile' and 'brittle' materials.	CO1	K1
b.	Explain alloy formation.	CO2	K1
c.	What is the T.T.T. diagram in the context of steel heat treatment?	CO3	K1
d.	Explain the structure of an optical fiber.	CO4	K1
e.	Define composite material.	CO5	K1

PART – B(10 x 5=50 Marks)

Answer ***ALL*** the questions		Marks	CO #	Blooms Level
2. a.	Explain the mechanism of plastic deformation in metals. Discuss the roles of slip and twinning.	5	CO1	K2
b.	Discuss the concept of 'Cold Working' and 'Hot Working' of metals. Explain the differences between them.	5	CO1	K3
	(OR)			
c.	What are homogeneous and heterogeneous nucleation processes in the solidification of metals?	5	CO1	K1
d.	Explain the concepts of recovery, recrystallization, and grain growth in metals during heat treatment.	5	CO1	K2
3.a.	Explain the different types of alloys and the factors that govern solubility in solid solutions	5	CO2	K2
b.	Explain the various types of phase diagrams: Isomorphous, Eutectic, Peritectic, Eutectoid, and Peritectoid systems.	5	CO2	K2
	(OR)			
c.	Explain the iron-cementite (Fe-Fe_3C) phase diagram and its importance in understanding steel and cast iron behavior.	5	CO2	K2
d.	Describe the effect of non-equilibrium cooling on the solidification of alloys, and explain the concept of homogenization.	5	CO2	K3
4.a.	Describe the microstructural effects of the heat treatment processes of annealing, normalizing, hardening, and tempering in steels.	5	CO3	K3
b.	How does the alloy composition influence the mechanical properties and microstructure of high-strength low-alloy (HSLA) steels?	5	CO3	K4
	(OR)			
c.	Compare the microstructures and typical applications of different types of cast irons: gray iron, white iron, ductile iron, and malleable iron.	5	CO3	K2

d.	Explain the concept of plastic deformation in metals, yield point phenomena, CRSS, recovery, recrystallization, and grain growth.	5	CO3	K3
5.a.	Describe the construction, working, and applications of a Helium-Neon (HeNe) laser.	5	CO4	K4
b.	What is the principle behind optical fiber communication, and how does it work?	5	CO4	K3
	(OR)			
c.	Compare and contrast thermosetting plastics and thermoplastics with respect to their structure, properties, and applications.	5	CO4	K2
d.	Discuss the types, structure, mechanical properties, and applications of ceramics.	5	CO4	K4
6.a.	Explain the classification of composite materials.	5	CO5	K3
b.	Discuss the types of reinforcements used in composite materials and their characteristics.	5	CO5	K2
	(OR)			
c.	What are the characteristics of Metal Matrix Composites (MMCs) and how are they selected for specific applications?	5	CO5	K3
d.	What are the types of matrix materials used in Metal Matrix Composites (MMCs) and how are they selected for various applications?	5	CO5	K3

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