Q. Code: 742315

Reg. No. | | | | | | | | | | | | | |

B.E. / B. TECH. DEGREE EXAMINATIONS, MAY 2023

Second Semester

MR22202 – MATERIAL SCIENCE AND ENGINEERING

(Marine Engineering)

(Regulation 2022)

TIME: 3 HOURS **MAX. MARKS: 100**

COURSE OUTCOMES	STATEMENT	RBT LEVEL
CO 1	Understand the Fundamentals of Metallurgy, Properties of metals and crystallography.	**2**
CO 2	Understand the various heat treatment processes.	**2**
CO 3	Understand the various mechanical property testing methods.	**2**
CO 4	Understand how different materials are selected for different uses on board ships, welding and corrosion metallurgy, bonding, and Non-destructive testing.	**2**
CO 5	Appreciate the various properties of the latest materials, including non-metals.	**2**

PART- A (20 x 2 = 40 Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	What do you understand by the term crystallography and how is it related to material science?	**1**	**2**
2.	Briefly justify the use of steel in the construction of ships?	**1**	**2**
3.	What do you understand by the term edge dislocation in crystal?	**1**	**2**
4.	What are the reasons for the wide spread use of Aluminium in everyday life	**1**	**2**
5.	Compare nitriding and carburizing	**2**	**1**
6.	What is the primary purpose of isothermal transformation diagram?	**2**	**2**
7.	What are the main reasons for Performing Heat treatment of steels / metals?	**2**	**1**
8.	How do you overcome the limitations of conventional hardening in martempering?	**2**	**1**
9.	Explain the term plastic deformation	**3**	**2**
10.	How do you determine the 'factor of safety' when designing objects?	**3**	**2**
11.	What is the importance of the fracture toughness test in materials testing?	**3**	**2**
12.	How can you differentiate between a ductile and brittle material	**3**	**2**
13.	What is the purpose for studying welding metallurgy?	**4**	**1**
14.	What are the potential limitations of the visual observation method in NDT	**4**	**2**
15.	What is the term 'HAZ' around the weld?	**4**	**2**
16.	How are adhesives classified?	**4**	**2**
17.	Compare Bottom-up and Top-down approaches in making nano-materials.	**5**	**2**
18.	Justify the need for the discovery and development of nanomaterials.	**5**	**2**
19.	Why do ceramics find applications in the marine industry?	**5**	**2**
20.	Why have composites not totally replaced mild steel in construction of ships?	**5**	**2**

PART- B (5 x 10 = 50 Marks)

		Marks	CO	RBT LEVEL
21. (a)	Explain the importance of the Iron-Carbon phase diagram with appropriate sketch/ sketches.	**(10)**	**1**	**2**
	(OR)			
(b)	Discuss the properties of Aluminium and Copper. Also mention a few useful marine alloys of Aluminium and Copper.	**(10)**	**1**	**2**
22. (a)	Discuss the different annealing processes and their applications.	**(10)**	**2**	**2**
	(OR)			
(b)	Describe the vacuum hardening process in detail with suitable drawings.	**(10)**	**2**	**2**
23. (a)	Detail the Izod or Charpy test for measuring the Impact Strength of Materials with needed sketches.	**(10)**	**3**	**2**
	(OR)			
(b)	Discuss the Brinell and Vicker's Hardness test with appropriate sketches.	**(10)**	**3**	**2**
24. (a)	Explain Radiographic testing in detail and discuss applications, advantages and disadvantages.	**(10)**	**4**	**2**
	(OR)			
(b)	Discuss the features and importance of HAZ in welding metallurgy.	**(10)**	**4**	**2**
25. (a)	Describe in detail the Chemical Vapour Deposition method used for manufacturing carbon nanotubes.	**(10)**	**5**	**2**
	(OR)			
(b)	Discuss about polymers as marine materials. Give applications, advantages and disadvantages.	**(10)**	**5**	**2**

PART- C (1 x 10 = 10 Marks)

(Q.No.26 is compulsory)

		Marks	CO	RBT LEVEL
26.	Justify the use of Mild steel in the construction of ships/ marine field.	**(10)**	**4**	**3**

****