Q. Code: 144772

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

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

Third Semester

ME18303 – MATERIAL CHARACTERIZATION AND METALLURGY

(Mechanical Engineering)

(Regulation 2018/2018A)

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

COURSE OUTCOMES	STATEMENT	RBT LEVEL
CO 1	Students can contrast the impact of carbon concentration on the formation of micro constituents in the Iron-Carbon system, as well as acquire the knowledge on microstructure and properties of different types of steels and cast irons.	**4**
CO 2	Students will have the ability to recognize how the non-equilibrium phases are formed in steels and distinguish them using the Time-Temperature-Transformation diagram.	**3**
CO 3	Students can select and justify the bulk heat treatment and surface treatment techniques of steels for various engineering applications.	**3**
CO 4	Students will have the ability to identify the suitable plastics, ceramics and composites for different engineering applications based on their properties.	**3**
CO 5	Students can distinguish brittle and ductile fractures and evaluate the mechanical properties of both ferrous and non-ferrous alloys through different mechanical testing as per ASTM standards.	**4**

PART- A (10 x 2 = 20 Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	State the importance of phase diagram.	**1**	**3**
2.	Distinguish between eutectic and eutectoid reactions.	**1**	**3**
3.	How the annealing helps to improve the properties of rolled materials.	**2**	**3**
4.	Distinguish between hardening and hardness.	**2**	**3**
5.	What is S.G iron? Give any two applications of the same.	**3**	**3**
6.	How is the brass differing from bronze?	**3**	**3**
7.	Distinguish between thermoplastics and thermosetting plastics.	**4**	**3**
8.	Why the ceramics are having low toughness?	**4**	**3**
9.	Distinguish between hardness and toughness.	**5**	**3**
10.	Why creep strength is important for materials subjected to high temperature?	**5**	**3**

PART- B (5 x 14 = 70 Marks)

			Marks	CO	RBT LEVEL
11. (a)		With neat sketch, discuss the various micro constituents and invariant reaction of Iron-Iron Carbide system when subjected to equilibrium cooling.	**(14)**	**1**	**3**
		(OR)			
(b)	**(i)**	Draw the phase diagram for completely soluble materials and explain the different phases with suitable example.	**(10)**	**1**	**3**

	(ii)	State the Hume Ruthory's rule governing the substitutional solid solution.	**(4)**	**1**	**3**
12. (a)		What is the significance of TTT diagram? Explain the construction of the same with neat sketches.	**(14)**	**2**	**3**
		(OR)			
(b)	**(i)**	Recommend the suitable heat treatment process to relieve the internal stresses and increase the machinability. Explain the procedure of the processes with neat diagram.	**(10)**	**2**	**3**
	(ii)	Write short notes on carburizing.	**(4)**	**2**	
13. (a)	**(i)**	How will you classify the stainless steels? Discuss the composition, properties and applications of any two stainless steels.	**(10)**	**3**	**3**
	(ii)	Discuss the effects of manganese and molybdenum in steels as alloying elements.	**(4)**	**3**	**3**
		(OR)			
(b)	**(i)**	How will you improve the strength of Al-Cu alloy? Explain the procedure with suitable diagram.	**(10)**	**3**	**3**
	(ii)	Write short notes on tool steels.	**(4)**	**3**	**3**
14. (a)	**(i)**	Recommend the suitable ceramics for producing the disc brakes of automobiles and discuss its composition, properties and its other applications.	**(10)**	**4**	**3**
	(ii)	Write short notes on FRP.	**(4)**	**4**	**3**
		(OR)			
(b)	**(i)**	Why polymerization is important? Explain the different method of polymerization with suitable sketches.	**(10)**	**4**	**3**
	(ii)	Distinguish between ABS & PET with respect to properties and applications.	**(4)**	**4**	**3**
15. (a)		How the tensile properties are tested? Explain the procedure of the same with neat diagrams and graphs.	**(14)**	**5**	**4**
		(OR)			
(b)	**(i)**	What is S-N curve? Explain the procedure to test the strength of components with neat diagrams and S-N curve.	**(10)**	**5**	**4**
	(ii)	Distinguish between brittle and ductile fracture.	**(4)**	**5**	**4**

PART- C (1 x 10 = 10 Marks)

(Q.No.16 is compulsory)

			Marks	CO	RBT LEVEL
16.	**(i)**	How will to test the toughness of the steel? Explain the procedure with neat diagrams.	**(6)**	**5**	**4**
	(ii)	Write short notes on slip in plastic deformation.	**(4)**	**5**	**4**