Q. Code:434714

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

B.E. / B.TECH. DEGREE EXAMINATIONS, MAY 2024

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.	What is the significance of lever rule of phase diagram.	**1**	**1**
2.	Distinguish between peritectic and peritectoid reactions.	**1**	**3**
3.	Distinguish between annealing and normalizing.	**2**	**3**
4.	Carburizing is one of the selective hardening processes – TRUE/FALSE. Justify.	**2**	**3**
5.	What is nodular iron? Give any two applications of the same.	**3**	**1**
6.	How is the brass differing from copper?	**3**	**2**
7.	Thermosetting plastics can be recycled – TRUE/FALSE. Justify.	**4**	**3**
8.	Why the ceramics are having low impact strength?	**4**	**3**
9.	What is endurance limit?	**5**	**1**

			Marks	CO	RBT LEVEL
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)		Draw the Iron-Iron carbide system and explain its constituents and invariable reactions.	**(14)**	**1**	**3**
		(OR)			
(b)	**(i)**	Draw the phase diagram for binary isomorphous system 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**	**2**
12. (a)		Which diagram depicts the presents of both the equilibrium and non-equilibrium constituents of steel? Explain the construction of the same with neat sketches.	**(14)**	**2**	**3**
		(OR)			
(b)	**(i)**	Recommend the suitable heat treatment process to refine the grain size and increase the strengths. Explain the procedure of the same with neat diagram.	**(10)**	**2**	**3**
	(ii)	Write short notes on flame hardening.	**(4)**	**2**	**1**
13. (a)	**(i)**	How will you classify the tool steels? Discuss the composition, properties and applications of any two tool steels.	**(10)**	**3**	**3**
	(ii)	Discuss the effects of vanadium and tungsten in steels as alloying elements.	**(4)**	**3**	**3**
		(OR)			
(b)	**(i)**	What is precipitation hardening? Explain the procedure of the same with suitable diagram to improve the strength of Al-Cu alloy.	**(10)**	**3**	**3**
	(ii)	Write short notes on bearing alloy.	**(4)**	**3**	**2**
14. (a)	**(i)**	Recommend the suitable ceramics for producing the pump outer casing and discuss its composition, properties and its other applications.	**(10)**	**4**	**3**
	(ii)	Write short notes on composite materials.	**(4)**	**4**	**2**
		(OR)			
(b)	**(i)**	Explain the different method of condensation polymerization with suitable example.	**(10)**	**4**	**3**
	(ii)	Distinguish between PE & PP with respect to properties and applications.	**(4)**	**4**	**2**
15. (a)		How the UTS and yield points for mild steel are tested? Explain the procedure of the same with neat diagrams and graphs.	**(14)**	**5**	**4**
		(OR)			
(b)	**(i)**	What is fatigue failure? Explain the procedure to test the fatigue strength of rotating components with neat diagrams and SN curve.	**(10)**	**5**	**4**

			Marks	CO	RBT LEVEL
	(ii)	Distinguish between fatigue and creep.	**(4)**	**5**	**2**

PART- C (1 x 10 = 10 Marks)

(Q.No.16 is compulsory)

			Marks	CO	RBT LEVEL
16.	**(i)**	How to test the impact strength of the railway track? Explain the procedure with neat diagrams.	**(6)**	**5**	**4**
	(ii)	Distinguish between Brinell and Vickers hardness testings?	**(4)**	**5**	**2**

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