Exam Date & Time: 12-Dec-2023 (02:30 PM - 05:30 PM)





MANIPAL ACADEMY OF HIGHER EDUCATION

VII SEMESTER B.TECH. (MECHANICAL) COURSE NAME: THERMAL TREATMENT OF METALS AND ALLOYS OPEN ELECTIVE (OE-IV)-MME 4308

Thermal Treatment of Metals and Alloys [MME 4308]

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Marks: 50

Duration: 180 mins.

Answer all the questions.

Instructions to Candidates: Answer ALL questions Missing data may be suitably assumed

1)		With sketch Illustrate the invariant reactions involved in the iron-carbon equilibrium diagram by depicting the phases present at different temperature and carbon composition ranges. Also find the relative amounts of ferrite and cementite in a steel containing 0.2%	(5)
	A)	C	(0)
	B)	With a suitable heat treatment cycle explain the difference between annealing and normalising treatment	(3)
	C)	Explain the process of transitioning from the Austenite to the Bainite phase in brief using the Time-Temp-Transformation diagram	(2)
2)		With a neat sketch explain the Jominey end quench test method for the determination of hardenability	(5)
	A)		
	B)	What defines temper brittleness, and what are the underlying causes of its occurrence	(3)
	C)	Explain the process of hardening heat treatment with suitable heat treatment cycle	(2)
3)		Describe with sketch the heat treatment procedure for flame hardening	
			(4)
	A)		
	B)	Explain the thermo-chemical treatment process of Gas carburising and solid carburizing methods	(4)
	C)	List the benefits and drawbacks that should be considered while carrying out induction hardening treatment process	(2)
4)		Describe the age/precipitation hardening procedure for non-ferrous materials using an appropriate heat treatment cycle	(4)

5/16/24, 9:26 AM	MME 4308	
A)		
B)	With the help of suitable heat treatment cycle explain the importance of Cold rolling and Aus-forming thermo-mechanical treatment techniques	(4)
C)	Briefly explain importance of High strength low alloy (HSLA) steel	(2)
5)	Write the specification of AISI 5120 (5: Chromium steel) and AISI 4140 (4: Molybdenum) and Explain the following defects associated with heat treatment i) Cracks ii) Over heating	(4)
A)		
B)	Write a note on i) Types of steel ii) White Cast iron	(3)
C)	Briefly explain importance of i) Aluminium alloy ii) Copper alloy	(3)

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