CBCS SCHEME

USN | | | | | | | | | | |

18MT32

Third Semester B.E. Degree Examination, July/August 2021
Material Science and Technology

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions.***

1 a. Define the following :
   i) Ultimate tensile strength
   ii) Hooke's law
   iii) Toughness
   iv) Resilience
   v) Offset yield strength. **(10 Marks)**

b. State the two Fick's law of diffusion. Also discuss the factors affecting it. **(10 Marks)**

2 a. Differentiate between Ductile and Brittle fracture. **(05 Marks)**

b. Derive an expression for stress relaxation. **(08 Marks)**

c. What is fatigue limit? Explain S-N cure with neat diagram. **(07 Marks)**

3 a. What are steps for construction of TTT diagram? Explain with neat sketch. **(10 Marks)**

b. What is annealing? What are the types of annealing? Explain full annealing for hypo-eutectoid and hyper eutectoid steel. **(10 Marks)**

4 a. Explain flame hardening process and Induction hardening process. **(08 Marks)**

b. Enumerate the composition, properties and applications of steels based on carbon content. **(09 Marks)**

c. What are the applications of Admiral brass? **(03 Marks)**

5 a. What is Homogenous nucleation? Derive an expression for critical radius and hence an expression for net energy change required for stable nuclear formation. **(08 Marks)**

b. The solidus and liquids temperatures for an alloy system containing two metals A and B. which are completely soluble in the liquid and solid state are presented in table below. Metal A melts at 1080°C, and metal B at 1450°C.
   i) Construct the phase diagram for this system and label each region
   ii) Predict the number; type, relative amounts and composition of phases present in an alloy containing 60% A and 40% B at 1250°C and room temperature.
   iii)

Sl No.	Alloy composition (wt %)	Solidus temperature (°C)	liquids temperatures (°C)
1	90% A ; 10% B	1100	1175
2	60% A ; 40% B	1160	1290
3	20% A ; 80% B	1310	1400

(12 Marks)

6 a. With neat sketch, explain substitutional and interstitial solid solution. **(04 Marks)**

b. Explain Gibb's phase rule and Lever rule. **(10 Marks)**

c. Explain undercooling and Solidification of pure metals. **(06 Marks)**

7	a.	What is the role of matrix and reinforcement in composites?	(06 Marks)
	b.	Explain pressure bag and vacuum bag moulding with neat sketches.	(10 Marks)
	c.	With a neat diagram, explain hand layup process.	(04 Marks)
8	a.	What is the need for MMC's and mention its applications.	(06 Marks)
	b.	Differentiate between Thermoplastic and Thermoset.	(06 Marks)
	c.	With a neat sketch, explain compression moulding and Resin transfer moulding.	(08 Marks)
9	a.	What are Electrostrictive and Magnetostrictive materials? Explain their properties.	(08 Marks)
	b.	Stating the applications of Magnetorheological and electrorheological fluids, explain it.	(08 Marks)
	c.	Write a short note on Fibre optic sensors.	(04 Marks)
10	a.	What is the use of an accelectrometer and explain it.	(05 Marks)
	b.	What is a load cell? What are applications of it? Explain.	(05 Marks)
	c.	Write a short note on Microphones.	(05 Marks)
	d.	Write a short note on pressure sensors.	(05 Marks)

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