

BALLARI INSTITUTE OF TECHNOLOGY & MANAGEMENT

(Autonomous Institute under Visvesvaraya Technological University, Belagavi)

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Course Code

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Third Semester B.E. Degree Examinations, September / October 2024

MATERIAL SCIENCE AND METALLURGY

Duration: 3 hrs

Max. Marks: 100

- Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Missing data, if any, may be suitably assumed

<u>Q. No</u>	<u>Question</u>	<u>Marks</u>	<u>(RBTL:CO:PI)</u>
<u>MODULE – 1</u>			
1.	a. With the help of stress-strain diagram for a ductile material, explain mechanical properties.	10	(2 :1 : 1.6.1)
	b. With neat sketch explain plastic deformation of a single crystal by slip and twinning.	10	(2 :1 : 1.6.1)
OR			
2.	a. Define creep? With a neat sketch explain 3 stages of creep.	10	(2 :1 : 1.6.1)
	b. What is fatigue? With neat sketch explain fatigue test with S-N Diagram for Al and Steel.	10	(2 :1 : 1.6.1)
<u>MODULE – 2</u>			
3.	a. What is solid solution? Explain the factors affecting the formation of solid solution.	08	(2 :2 : 1.6.1)
	b. Explain homogeneous nucleation and obtain an expression for critical radius of nuclei.	12	(2 :2 : 1.6.1)
OR			
4.	a. Draw Iron – Carbon equilibrium phase diagram and explain the different phases in it.	10	(2 :2 : 1.6.1)
	b. Briefly discuss about the invariant reactions.	06	(2 :2 : 1.6.1)
	c. Explain the mechanism of strengthening in metals.	04	(2 :2 : 1.6.1)
<u>MODULE – 3</u>			
5.	a. Define heat treatment and give its classifications.	06	(1 :3 : 1.6.1)
	b. Draw and explain TTT diagram for Eutectoid steel (0.8% C).	08	(2 :3 : 1.6.1)
	c. Differentiate Austempering and Martempering heat treatment processes.	06	(2 :3 : 1.6.1)
OR			
6.	a. Explain the composition, properties and applications of grey cast iron, malleable cast iron and SG iron.	12	(2 :3 : 1.6.1)
	b. With a neat sketch explain the flame hardening process.	08	(2 :3 : 1.6.1)

MODULE – 4

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|-----------|---|-----------|----------------|
| 7. | a. Write the structure, properties and applications of polymers. | 06 | (2 :4 : 1.6.1) |
| | b. Define composites? How do you classify them? | 04 | (1 :4 : 1.6.1) |
| | c. With a neat sketch explain pultrusion process. | 10 | (2 :4 : 1.6.1) |

OR

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| 8. | a. How do you process plastics by injection moulding method? Discuss. | 12 | (2 :4 : 1.6.1) |
| | b. List the advantages, disadvantages and applications of composites | 08 | (2 :4 : 1.6.1) |

MODULE – 5

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|-----------|---|-----------|----------------|
| 9. | a. What is a smart material? Explain any two types of smart materials. | 10 | (1 :5 : 1.6.1) |
| | b. Discuss the Nano materials and their applications. | 06 | (2 :5 : 1.6.1) |
| | c. Enlist various applications of powder metallurgy. | 04 | (2 :5 : 1.6.1) |

OR

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| 10. | a. What are the desirable characteristics of binders? | 04 | (1 :5 : 1.6.1) |
| | b. Explain the construction and working principle of a scanning electron microscopy. | 10 | (2 :5 : 1.6.1) |
| | c. State the necessity of characterization. | 06 | (2 :5 : 1.6.1) |

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