

Basavarajeswari Group of Institutions
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 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. Show the stress-strain diagram for a ductile and brittle materials and, explain mechanical properties.	10	(2 :1 : 1.6.1)
	b. Explain the properties in elastic and plastic range in detail forms.	10	(2 :1 : 1.6.1)
(OR)			
2.	a. With neat sketch explain plastic deformation of a single crystal by slip and twinning	10	(2 :1 : 1.6.1)
	b. Discuss the Fick's laws of diffusion and factors that are affecting diffusion.	10	(2 :1 : 1.6.1)
<u>Module-2</u>			
3.	a. With help of neat sketch explain ductile and brittle fractures.	10	(2 :2: 1.6.1)
	b. What is fatigue? With neat sketch, explain fatigue test with S-N diagram for Al and Steel.	10	(2 :2 : 1.6.1)
(OR)			
4.	a. Discuss the factors affecting fatigue life	08	2 :2 : 1.6.1)
	b. Define creep and its properties. With a neat sketch explain 3 stages of creep.	12	(2 :2 : 1.6.1)
<u>Module-3</u>			
5.	a. State the Hume Rothary rules for formation Substitutional solid solution.	06	(2 :3 : 1.6.1)
	b. Explain mechanism of solidification with neat sketches.	10	(2 :3 : 1.6.1)
	c. Explain the Gibb's phase rule.	04	(2:3 : 1.6.1)
(OR)			
6.	a. Draw Iron – Carbon equilibrium phase diagram and explain the different phases.	10	(2 :3 : 1.6.1)

Note: (RBTL - Revised Bloom's Taxonomy Level: CO - Course Outcome: PI- Performance Indicator)

- b.** Derive an expression for critical radius in homogeneous nucleation and discuss its significances. **10** (2 :3 : 1.6.1)

Module-4

- 7.** **a.** Define heat treatment and discuss annealing, normalizing heat treatment processes with sketches. **10** (2 :4 : 1.6.1)
- b.** Draw the TTT diagram for Eutectoid steel (0.8% C) and explain different phases with respective temperature. **10** (2 :4 : 1.6.1)

(OR)

- 8.** **a.** Explain flame hardening method with neat sketch. **10** (2:4 : 1.6.1)
- b.** Explain the mechanism of strengthening in metals. **10** (2 :4 : 1.6.1)

Module-5

- 9.** **a.** Explain the composition, properties and applications of grey cast iron, malleable cast iron and SG iron. **10** (2 :5 : 1.6.1)
- b.** With the help of neat sketch, explain the stir casting process for production of MMC's. **10** (2 :5 : 1.6.1)

(OR)

- 10** **a.** With the help of neat sketch, explain injection moulding process for PMC's. **10** (2 :5 : 1.6.1)
- b.** Explain pultrusion process for manufacturing of polymer composites with neat sketches. **10** (2 :5 : 1.6.1)

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