Basavarajeswari Group of Institutions

BALLARI INSTITUTE OF TECHNOLOGY & MANAGEMENT

(Autonomous Institute under Visvesvaraya Technological University, Belagavi)

USN											Course Code	2	1	M	E	3	3

Third Semester B.E. Degree Examinations, March/April 2023

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

Q. No		*Question*	*Marks*	*(RBTL:CO: PI)*
		MODULE – 1		
1.	**a.**	What is Engineering Material? How do you classify them?	**04**	(1 :1: 1.6.1)
	b.	Draw the stress- strain diagram for mild steel and explain proportionality limit, elastic limit, yield and ultimate loads.	**08**	(2 :1: 1.6.1)
	c.	Explain plastic deformation of single crystal by slip and twinning with a neat sketch.	**08**	(2 :1: 1.6.1)
		OR		
2.	**a.**	Discuss Type-I, Type-II and Type-III fractures.	**08**	(2 :1: 1.6.1)
	b.	What is Fatigue? Explain fatigue testing with S-N diagram.	**08**	(2 :1: 1.6.1)
	b.	Show and label the three stages of creep curve.	**04**	(1 :1: 1.6.1)
		MODULE – 2		
3.	**a.**	Explain the mechanism of solidification.	**06**	(2 :2: 1.6.1)
	b.	What is solid solution? Discuss Hume-Rothery rules for formation of solid –solution.	**08**	(2 :2: 1.6.1)
	c.	With neat sketch, explain cast metal structure.	**06**	(2 :2: 1.6.1)
		OR		
4.	**a.**	Draw a neat Iron- Carbon equilibrium diagram and label all phases and write invariant reactions like eutectoid, eutectic and peritectic reactions.	**10**	(2 :2: 1.6.1)
	b.	Derive an expression for critical radius in homogeneous nucleation.	**04**	(2 :2: 1.6.1)
	c.	Explain the mechanism of strengthening in metals.	**06**	(2 :2: 1.6.1)
		MODULE – 3		
5.	**a.**	Explain annealing, normalizing and hardening heat treatment processes.	**06**	(2 :3: 1.6.1)
	b.	Discuss different phases with the help of TTT curve.	**08**	(2 :3: 1.6.1)
	c.	What is Hardenability? Discuss various factors affecting hardenability.	**06**	(2 :3: 1.6.1)
		OR		
6.	**a.**	Discuss Nitriding and Flame hardening processes.	**08**	(2 :3: 1.6.1)
	b.	With Al-Cu phase diagram, explain age-hardening process.	**08**	(2 :3: 1.6.1)
	c.	Explain properties, composition and uses of Gray Cast Iron**.**	**04**	(2 :3: 1.6.1)

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

MODULE – 4

7.	**a.**	Give a broad classification of composite.	**04**	(2 :4: 1.6.1)
	b.	Discuss various applications of ceramics and polymers.	**08**	(2 :4: 1.6.1)
	c.	Explain 'pultrusion processes for manufacturing composites.	**08**	(2 :4: 1.6.1)

OR

8.	**a.**	Explain 'Injection moulding processes' for manufacturing composites.	**08**	(2 :4: 1.6.1)
	b.	Discuss the characterization of metal 'Reinforcement materials'	**04**	(2 :4: 1.6.1)
	c.	Discuss need for MMC's and its application.	**08**	(2 :4: 1.6.1)

MODULE – 5

9.	**a.**	What are the smart materials? Discuss the functioning of shape memory alloys**.**	**08**	(2 :5: 1.6.1)
	b.	Discuss the nano materials and their applications.	**06**	(2 :5: 1.6.1)
	c.	Write a short note on Electro-rheological fluids and Piezo-electric materials.	**06**	(2 :5: 1.6.1)

OR

10.	**a.**	Discuss the powder metallurgy processes.	**06**	(2 :5: 1.6.1)
	b.	Describe the applications of powder metallurgy.	**06**	(2 :5: 1.6.1)
	c.	Explain the construction and working principle of scanning electron microscopy with a neat sketch.	**08**	(2 :5: 1.6.1)

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