U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

January / February 2025 Semester End Main Examinations

Programme: B.E. **Semester: III**

Branch: Aerospace Engineering **Duration: 3 hrs.**

Course Code: 23AS3PCMAE / 22AS3PCMAE **Max Marks: 100**

Course: Materials for Aerospace Engineering

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

			UNIT - I	***CO***	***PO***	**Marks**
1	a)		What are the key factors considered for aerospace materials selection? Discuss.	*CO1*	*PO 1, 7*	**06**
	b)		Briefly discuss the advantages and disadvantages of polymers for aerospace applications. Differentiate thermosets and thermoplastics and elastomer polymers.	*CO3*	*PO1, 2*	**09**
	c)		With the help of an example, explain the effect of load and temperature on shape memory effect in materials. Mention three possible applications of shape memory alloys.	*CO2*	*PO1, 2*	**05**
			OR			
2	a)		What are intermetallic compounds? Outline their applications.	*CO2*	*PO1, 2*	**04**
	b)		Briefly describe corrosion process. Explain the corrosion protection / avoidance methods available for aircraft materials.	*CO2*	*PO1, 2*	**08**
	c)		Explain the concept of stealth in aircraft engineering. Discuss the role of materials in implementing stealth technology.	*CO3*	*PO1, 2*	**08**
			UNIT - II			
3	a)		Discuss the role of aluminium alloys in aircraft applications. Also give the IADS classification of aluminium alloys.	*CO2*	*PO1, 2*	**06**
	b)		Explain the thermal ageing process of aluminum alloys.	*CO2*	*PO1, 2*	**06**
	c)		Differentiate non-age-hardenable and age-hardenable aluminium alloys with examples.	*CO2*	*PO1, 2*	**08**
			OR			
4	a)		What are the advantages and disadvantages of using titanium alloys for aerospace applications?	*CO2*	*PO1, 2*	**05**
	b)		Briefly discuss the characteristics and applications of alpha, beta and combined alpha - beta titanium alloys.	*CO2*	*PO1, 2*	**08**

		c)	Why is copper used as an alloying element? In the context of aerospace applications, briefly discuss the role played by copper alloys.	*CO2*	*PO1, 2*	**07**
			UNIT - III			
	5	a)	Write a note on the properties and applications of maraging steels for aircraft applications	*CO2*	*PO1, 2*	**06**
		b)	Briefly discuss the microstructural phases of steels.	*CO2*	*PO1*	**07**
		c)	Discuss the characteristics and applications of Cobalt-based super alloys.	*CO2*	*PO1*	**07**
			OR			
	6	a)	Write a note on the properties and applications of stainless steels	*CO2*	*PO1, 2*	**06**
		b)	Briefly discuss the types, properties and applications of low-alloy steels	*CO2*	*PO1*	**07**
		c)	Discuss the characteristics and applications of nickel-based super alloys.	*CO2*	*PO1*	**07**
			UNIT - IV			
	7	a)	What is a ceramic matrix composite? Enumerate their applications in aircraft structures.	*CO3*	*PO1*	**06**
		b)	Explain the production process and properties of carbon fibers	*CO3*	*PO1*	**06**
		c)	With a neat schematic, briefly explain the manufacturing of metal matrix composites.	*CO3*	*PO1*	**08**
			OR			
	8	a)	What is a cermet? Discuss their use for aircraft applications.	*CO3*	*PO1*	**06**
		b)	Classify and discuss various fibers and matrix materials used in making of composites.	*CO3*	*PO1*	**07**
		c)	Bring out the detailed applications of composite materials in aerospace industry.	*CO3*	*PO1*	**07**
			UNIT - V			
	9	a)	Explain the concept of strain hardening with a neat sketch.	*CO3*	*PO1*	**06**
		b)	Illustrate and explain the salient aspects of a tension test.	*CO3*	*PO1*	**06**
		c)	Briefly explain any two non-destructive test methods employed to assess flaws in materials.	*CO3*	*PO1*	**08**
			OR			
	10	a)	Explain Bauschinger's effect with a neat sketch.	*CO3*	*PO1*	**06**
		b)	Illustrate and discuss following material tests. i) Bending test ii) Torsion test iii) Shear test iv) Hardness test	*CO3*	*PO1*	**08**
		c)	With the help of relevant plots, compare the stress-strain behavior of brittle and ductile materials under tensile loads.	*CO3*	*PO1*	**06**

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