Code No: **R194203S** **R19** **Set No. 1**

IV B.Tech II Semester Regular Examinations, April– 2023

ADVANCED MATERIALS

(Open Elective)

Time: 3 hours **Max. Marks: 75**

Answer any FIVE Questions
ONE Question from Each unit
All Questions Carry Equal Marks

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UNIT I

1 a) What are the characteristic of fiber that are to be used in reinforcement? Explain. [7]

b) Explain the mechanism of strengthening in ceramic composites with neat diagrams [8]

(OR)

2 Describe the classification of composites? Mention applications of each. [15]

UNIT II

3 a) Define a polymer composite. Explain the classification of polymer composites. Mention the advantageous and limitation of polymer composites. [7]

b) Describe the filament winding process with neat diagram [8]

(OR)

4 a) Describe the RTM process with neat diagram. [7]

b) Describe the powder metallurgy technique with flow chart, for fabrication of CCC. [8]

UNIT III

5 a) Derive generalized Hooke's law for a lamina. [7]

b) What is lamination theory? Describe with sketch of laminate stacking sequence code. [8]

(OR)

6 a) What are the assumptions made in the classical lamination theory? Explain. [7]

b) Deduce the stiffness matrix for a lamina from generalized Hooke's law. [8]

UNIT IV

7 What is shape memory alloy? Explain the shape memory effect [15]

(OR)

8 How the Functionally graded materials are classified? Explain their applications. [15]

UNIT V

9 a) Describe the properties of nano-materials. [7]

b) Enumerate the applications of Nanomaterials in Aerospace Industry. [8]

(OR)

10 a) Discuss the advantages & limitations of nanomaterials. [7]

b) Write a note on applications of nano-material for structural applications. [8]

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Code No: **R194203S** **R19** **Set No. 2**

IV B.Tech II Semester Regular Examinations, April– 2023

ADVANCED MATERIALS

(Open Elective)

Time: 3 hours **Max. Marks: 75**

Answer any FIVE Questions
ONE Question from Each unit
All Questions Carry Equal Marks

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UNIT I

1 a) Explain the mechanism of strengthening in fiber reinforced composites with neat diagrams. [7]

b) A polymer composite has 60% glass fiber in epoxy matrix. If the elastic moduli of glass is 85 GPa and that of epoxy is 3.4 GPa. Compare:
(i) Modulus of elasticity of the composite in fiber direction
(ii) Modulus of elasticity in transvers direction
(iii) Load carried by the fibe [8]

(OR)

2 Explain the mechanism of strengthening in metal matrix composites with neat diagrams [15]

UNIT II

3 a) Describe the pultration process with neat diagram. [7]

b) How the metal matrix composites are different from polymer matrix composites? Explain. [8]

(OR)

4 a) What are the properties of thermosetting and thermoplast products. [7]

b) Describe the hand layup process with neat diagram. [8]

UNIT III

5 a) Describe the laminate- laminate code. [7]

b) What is an angle –ply lamina? Explain its specific features. [8]

(OR)

6 a) What is mid-plane symmetric laminates? Explain its specific features. [7]

b) How the Hooks law is reduced from three dimensions to two dimensions? Explain. [8]

UNIT IV

7 a) Explain various types of functionally graded materials. [7]

b) Describe the phenomenology of phase transformation in shape memory alloys [8]

(OR)

8 a) Explain the mechanical properties of functionally graded materials. [7]

b) Mention the properties of shape memory alloys. In what way these are different? Explain. [8]

UNIT V

9 What are the possible applications of CNTs? Explain briefly. [15]

(OR)

10 a) Enumerate the applications of Nanomaterials in Automobile Industry. [7]

b) Mention the applications of Nanomaterials in comparison with bulk materials. [8]

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Code No: **R194203S** **R19** **Set No. 3**

IV B.Tech II Semester Regular Examinations, April– 2023

ADVANCED MATERIALS

(Open Elective)

Time: 3 hours **Max. Marks: 75**

Answer any FIVE Questions
ONE Question from Each unit
All Questions Carry Equal Marks

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UNIT I

1 Do all properties of composites always improve over their individual constituents? Give examples. [15]

(OR)

2 a) Discuss about the following
i) Glass fiber ii) carbon fiber [7]

b) What are the characteristic of fiber that are to be used in reinforcement? Explain. [8]

UNIT II

3 a) Describe one manufacturing method of metal matrix composites [7]

b) Explain the process of squeeze casting of MMC with neat diagram. [8]

(OR)

4 a) Explain the following composite manufacturing methods in detail
i) Filament winding
ii) Resin transfer molding (RTM) [15]

UNIT III

5 a) Write short notes on Longitudinal Young's modulus and Transverse Young's modulus. [7]

b) What is void content? Explain how it affects the density of a lamina? [8]

(OR)

6 Explain Hooks law for 3 Dimensional object with a neat sketch [15]

UNIT IV

7 Describe the Fraction gradient, Shape gradient and Naturally occurred FGMs. [15]

(OR)

8 Discuss the properties & applications of shape memory alloys. [15]

UNIT V

9 Discuss briefly about Nanowires and Mention their applications. [15]

(OR)

10 Explain the classification of nanostructures and Explain their applications [15]

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Code No: **R194203S** **R19** **Set No. 4**

IV B.Tech II Semester Regular Examinations, April– 2023

ADVANCED MATERIALS

(Open Elective)

Time: 3 hours **Max. Marks: 75**

Answer any FIVE Questions
ONE Question from Each unit
All Questions Carry Equal Marks

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UNIT I

1 What are composites? Discuss the roles (functions) of matrix and reinforcement in composite materials. [15]

(OR)

2 a) Determine the bulk modulus of (i) fiber (ii) Matrix and the inplane shear modulus of glass epoxy composite containing 65% fiber volume fraction. Given that Eg=85 GPa and Em= 3.4GPa, Poissions ratio Vf=0.2 and Vm=0.3, Shear modulus Gf=35.42GPa and Gm=1.308GPa. [7]

b) Explain about properties of Kevlar, silcon carbide fibres [8]

UNIT II

3 a) Write the applications of ceramic matrix composites and polymer composites. [7]

b) Define a thermosetting material. Mention the applications, advantageous and limitation of thermosetting materials. [8]

(OR)

4 a) What are the different molding methods used for manufacturing of composites. Describe injection molding process with neat diagram. [7]

b) Mention the applications, advantageous and limitations of autoclave process. [8]

UNIT III

5 Derive relationship for a Compliance stiffness matrix for 2 Dimensions. [15]

(OR)

6 a) Explain Engineering Elastic constant for Orthotropic lamina [7]

b) Explain generalized Hooks law [8]

UNIT IV

7 Mention the properties of shape memory alloys. In what way these are different? Explain. [15]

(OR)

8 How the functionally graded materials are prepared? Explain powder metallurgy technique with neat diagram. [15]

UNIT V

9 List out nanomaterials and explain the structure of any two nanomaterials. [15]

(OR)

10 Discuss the properties of materials at Nano scale. Mention their advantages & limitations. [15]

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