

Code No: R164103D

R16

Set No. 1

IV B.Tech I Semester Supplementary Examinations, July/Aug - 2021

ADVANCED MATERIALS

(Mechanical Engineering)

Time: 3 hours

Max. Marks: 70

Question paper consists of Part-A and Part-B

Answer ALL sub questions from Part-A

Answer any FOUR questions from Part-B

PART-A (14 Marks)

1. a) What are the applications of Kevlar reinforced composite? [2]
- b) Write the properties of thermosetting plastics? [2]
- c) Give the applications of closed mold FRP Process. [2]
- d) Give the expression for Reduced Hooke's law from three dimensions to two dimensions. [4]
- e) Classify functionally graded materials. [2]
- f) Give the applications of Nano composites. [2]

PART-B (4x14 = 56 Marks)

2. a) Briefly explain nature-made composites with their applications. [7]
- b) Mention various phases in fibrous composites. Explain their functions. [7]
3. a) Discuss the recent advances in Polymer Composites. [7]
- b) Explain the applications of carbon-carbon composite. [7]
4. a) List out the manufacturing methods of polymer matrix composite and explain any one of them with a neat sketch. [7]
- b) Discuss any one closed mold FRP Process with a neat sketch. [7]
5. a) Obtain stiffness matrix from compliance matrix for orthotropic materials. [7]
- b) Explain the principle of Hooke's Law and give a note on Hook's law for anisotropic (triclinic) materials. [7]
6. a) Name some shape memory alloys. Give the mechanical properties and applications of the above materials. [7]
- b) Discuss the applications of functionally graded materials. [7]
7. a) Explain the electrical properties of Nano materials. [7]
- b) Give a brief note on Nano wires and tubes. [7]



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IV B.Tech I Semester Regular Examinations, October/November - 2019

ADVANCED MATERIALS

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Max. Marks: 70

Question paper consists of Part-A and Part-B

Answer ALL sub questions from Part-A

Answer any FOUR questions from Part-B

PART-A(14 Marks)

1. a) Mention any two live applications of carbon-carbon composites in the field of electronics? [2]
- b) Mention the applications of Thermosetting plastics. [2]
- c) Explain the importance of fiber orientation in fiber reinforced composites. [3]
- d) What is a lamina and laminate? [2]
- e) Mention the properties of shape memory alloys. [3]
- f) What is the significance of specific surface area of nanomaterials? [2]

PART-B(4x14 = 56 Marks)

2. 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 fiber [7]
3. a) Describe the powder metallurgy technique with flow chart, for fabrication of CCC. [7]
- b) Define a polymer composite. Explain the classification of polymer composites. Mention the advantageous and limitation of polymer composites. [7]
4. a) Describe the RTM process with neat diagram. [7]
- b) What are the different molding methods used for manufacturing of composites. Describe injection molding process with neat diagram. [7]
5. a) Derive generalized Hooke's law for a lamina. [7]
- b) What are the assumptions made in the classical lamination theory? Explain. [7]
6. a) Describe the phenomenology of phase transformation in shape memory alloys. [7]
- b) Describe the Fraction gradient, Shape gradient and Naturally occurred FGMs. [7]
7. a) Describe the properties of nano-materials. [7]
- b) Write a note on applications of nano-material for structural applications. [7]



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Set No. 2

IV B.Tech I Semester Regular Examinations, October/November - 2019

ADVANCED MATERIALS

(Mechanical Engineering)

Time: 3 hours

Max. Marks: 70

Question paper consists of Part-A and Part-B

Answer ALL sub questions from Part-A

Answer any FOUR questions from Part-B

PART-A(14 Marks)

1. a) Mention any two applications of ceramic matrix composites in the field of aerospace. [2]
- b) Mention the applications of CCC in Aircraft Industry. [2]
- c) Discuss the effect of interface bonding on properties of composite. [3]
- d) Calculate V_f and ρ_c for a composite laminate containing 30% weight of E-glass fibres in a polyester resin. Assume $\rho_c=2.54$ g/ml and $\rho_f=1.1$ g/ml. [3]
- e) Mention the applications of shape memory alloys. [2]
- f) How resistivity varies for nano materials? [2]

PART-B(4x14 = 56 Marks)

2. a) Explain the mechanism of strengthening in metal matrix composites with neat diagrams. [7]
- b) What are the characteristic of fiber that are to be used in reinforcement? Explain. [7]
3. a) How the metal matrix composites are different from polymer matrix composites? Explain. [7]
- b) What are the properties of thermosetting and thermoplast products. [7]
4. a) Describe the filament winding process with neat diagram. [7]
- b) Describe the hand layup process with neat diagram. [7]
5. a) What is lamination theory? Describe with sketch of laminate stacking sequence code. [7]
- b) Deduce the stiffness matrix for a lamina from generalized Hooke's law. [7]
6. a) How the functionally graded materials are classified? Mention at least one applications of each. [7]
- b) Mention the properties of shape memory alloys. In what way these are different? Explain. [7]
7. a) Mention the advantages & disadvantages in comparison with bulk material. [7]
- b) What is meant by top-down approach in nano material synthesis? Explain. [7]



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Set No. 3

IV B.Tech I Semester Regular Examinations, October/November - 2019

ADVANCED MATERIALS

(Mechanical Engineering)

Time: 3 hours

Max. Marks: 70

Question paper consists of Part-A and Part-B

Answer ALL sub questions from Part-A

Answer any FOUR questions from Part-B

PART-A(14 Marks)

1. a) Mention any two applications of ceramic matrix composites in the field of aerospace. [2]
- b) Mention the applications of PMC in Aircraft Industry. [2]
- c) Differentiate between a lamina and laminate. [3]
- d) What are the common modes of failure of a unidirectional composite subjected to longitudinal tensile load? [3]
- e) What is shape memory alloy? [2]
- f) Mention any two advantages of powders in nano scales. [2]

PART-B(4x14 = 56 Marks)

2. a) Explain the mechanism of strengthening in ceramic composites with neat diagrams. [7]
- b) Describe the classification of composites? Mention at least one application of each. [7]
3. a) Define a thermosetting material. Mention the applications, advantageous and limitation of thermosetting materials. [7]
- b) Explain the process of squeeze casting of MMC with neat diagram. [7]
4. a) Describe the pultrusion process with neat diagram. [7]
- b) Mention the applications, advantageous and limitations of autoclave process. [7]
5. a) What is an angle -ply lamina? Explain its specific features. [7]
- b) How the Hooks law is reduced from three dimensions to two dimensions? Explain. [7]
6. a) Mention the properties of functionally graded materials. In what way these are different? Explain. [7]
- b) How the shape memory alloys are classified? Explain their composition. [7]
7. a) Mention the applications in comparison with bulk materials. [7]
- b) Explain bottom-up synthesis of nano materials. [7]



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Set No. 4

IV B.Tech I Semester Regular Examinations, October/November - 2019

ADVANCED MATERIALS

(Mechanical Engineering)

Time: 3 hours

Max. Marks: 70

*Question paper consists of Part-A and Part-B
Answer ALL sub questions from Part-A
Answer any FOUR questions from Part-B*

PART-A(14 Marks)

1. a) Mention any two live applications of metal matrix composites. [2]
- b) Mention the applications of MMC in automobile sector. [2]
- c) Define strength ratio. [2]
- d) Define rule of mixtures in the determination of elasticity modulus. [3]
- e) What is functionally graded material? [2]
- f) What is Sol-Gel method? [3]

PART-B(4x14 = 56 Marks)

2. a) Explain the mechanism of strengthening in carbon- carbon composites with neat diagrams. [7]
- b) 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 $E_g=85$ GPa and $E_m= 3.4$ GPa, Poissons ratio $V_f=0.2$ and $V_m=0.3$, Shear modulus $G_f=35.42$ GPa and $G_m=1.308$ GPa. [7]
3. a) Define a thermoplastic materials. Mention the applications, advantageous and limitation of thermoplastic materials. [7]
- b) Explain the process of solid state processing of MMC with neat diagram. [7]
4. a) Describe the autoclave process with neat diagram. [7]
- b) Mention the applications, advantageous and limitations of hand layup process. [7]
5. a) Describe the laminate- laminate code. [7]
- b) What is mid-plane symmetric laminates? Explain its specific features. [7]
6. a) How the functionally graded materials are prepared? Explain powder metallurgy technique with neat diagram. [7]
- b) What is shape memory alloy? Explain the shape memory effect. [7]
7. a) What are the possible applications of CNTs for pressure and gas sensor? Explain principle with neat diagram. [7]
- b) Explain Ball-milling for nano synthesis. [7]



IV B.Tech I Semester Supplementary Examinations, February- 2020

ADVANCED MATERIALS

(Mechanical Engineering)

Time: 3 hours**Max. Marks: 70***Question paper consists of Part-A and Part-B**Answer ALL sub questions from Part-A**Answer any FOUR questions from Part-B*

PART-A (14 Marks)

1. a) What is fiber reinforced composite? [2]
- b) Compare the properties of various reinforcements used in polymer composites. [3]
- c) Give the applications of open mold FRP Process. [2]
- d) Give the expression for compliance and stiffness matrix. [3]
- e) Explain shape memory effect. [2]
- f) What kinds of bulk materials exist? [2]

PART-B (4x14 = 56 Marks)

2. a) What is a Matrix? What are the various types of matrices used in the composite material? Explain the advantages and disadvantages and applications of each one of them. [7]
- b) Write the specific characteristics of Kevlar and Silicon Carbide. [7]
3. a) Discuss any one manufacturing method of Polymer matrix composite. [7]
- b) Give a brief note on Carbon Fiber-Reinforced Polymer (CFRP) Composites. [7]
4. a) List out the manufacturing methods of metal matrix composite and explain any one of them with a neat sketch. [7]
- b) Explain Resin transfer molding process with a neat sketch. [7]
5. a) Derive the compliance matrix of an orthotropic lamina. [7]
- b) List out the assumptions made in classical lamination theory. [7]
6. a) Briefly give a note on the types of functionally graded materials. [7]
- b) What do you mean by smart materials? Briefly explain shape memory alloys. [7]
7. a) Enumerate the applications of nano materials. [7]
- b) Briefly discuss the advances in Nano materials. [7]

