

Register No:

Name:

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

EIGHTH SEMESTER B.TECH DEGREE EXAMINATION (R), MAY 2024**Chemical Engineering****(2020 SCHEME)****Course Code : 20CHT444****Course Name : Composite Materials****Max. Marks : 100****Duration:3 Hours****Scientific calculator and statistical table is allowed in the examination hall.****PART A***(Answer all questions. Each question carries 3 marks)*

1. List the applications of aramid fiber-reinforced polymer composite.
2. What are the applications of a metal matrix composite, if the matrix used is Aluminium and fiber is Boron? Explain the role of matrix in the composite.
3. What are prepregs? Give an example.
4. Differentiate between continuous and discontinuous fiber reinforcement in thermoplastics.
5. Write down the basic criterion used in the selection of matrix materials for composite structures. Briefly describe its importance in determining the performance of the composite material.
6. Consider a scenario where a composite material is subjected to tensile loading, and predict the effect of increasing fiber alignment on the material's stiffness and strength.
7. Identify four common failure criteria used to predict the strength of laminated composite structures.
8. List the significance of mechanical testing in quality control for composite materials. Provide an example of a mechanical test commonly performed on composite specimens.
9. Consider a scenario where a composite structure needs to withstand high temperatures, suggest one suitable reinforcement material, and explain why it is appropriate for the application.
10. Explain the concept of hybrid composites and provide an example of how different types of reinforcements can be combined in a hybrid composite.

PART B*(Answer one full question from each module, each question carries 14 marks)***MODULE I**

11. (a) List the role of hybrid composites in aerospace structures. 7
(b) Differentiate thermosetting and thermoplastic composites in the case of polymeric composites. 7

OR

12. Explain the following 7
(a) Laminated composites. 5
(b) Fibre-reinforced composites. 5
(c) Particulate composites. 4

MODULE II

13. (a) List the testing methods of composite materials based on physical characteristics. 7
(b) Explain resin transfer moulding with a diagram. List down its advantages and disadvantages. 7

OR

14. Compare the economic and environmental sustainability of injection molding and compression molding processes. Evaluate the lifecycle costs, including initial investment, material usage, energy consumption, labor costs, and waste management. 14

MODULE III

15. (a) Consider a unidirectionally reinforced glass fiber/epoxy composite. The fibers are continuous and 60% by volume. The tensile strength of glass fibers is 1 GPa and Young's modulus is 70 GPa. The tensile strength of the epoxy matrix is 60 MPa and its Young's modulus is 3 GPa. Compute the Young's modulus and tensile strength of the composite in the longitudinal direction. 8
- (b) Define the rule of mixture in terms of i) Density ii) volume fraction, density, and weight of composite iii) weight fraction 6

OR

16. Analyze the factors that contribute to the toughness of fibrous composites. 14

MODULE IV

17. Analyze the significance of testing glass fiber reinforcements in composite materials. Choose two common testing methods used for assessing glass fiber properties. 14

OR

18. Explain any four types of non-destructive testing which is being generally conducted for composite materials. 14

MODULE V

19. Consider a scenario in the aerospace industry, and recommend a suitable synthesis method for fabricating a lightweight composite material with high strength and thermal stability. Justify your choice based on the requirements of the application. 14

OR

20. Briefly describe three natural fibers that are available for the production of green composites. Provide examples of plants or sources from which each fiber is derived. 14
