Reg. No. ☐☐☐☐☐☐☐☐☐☐

MSS 554

IV Semester M.Sc. Examination, September/October 2022
(CBCS)
MATERIALS SCIENCE
Composite Materials (Elective)

Time : 3 Hours   Max. Marks : 70

Instruction : *Answer **all** questions.*

1. a) Derive expressions for Young's modulus of a fiber reinforced composite under iso-stress and iso-strain conditions.

   b) Name the different types of composites with examples based on a matrix. How are important in engineering applications ?   **(14+6)**

                           OR

2. a) Discuss the mechanism of load transfer in a composite containing elastic fiber in a ductile matrix.

   b) Explain single and multiple modes of fracture in composites.

   c) A fiber-reinforced epoxy composite rod contains 60% by volume of glass fiber. All the fibers are aligned longitudinally. The Young's modulus of glass fiber is 65 GPa and epoxy resin is 6.9 GPa. Estimate the Young's modulus of composite in the longitudinal direction of fiber and the fraction of load transferred to the fiber.   **(7+7+6)**

3. a) Give an account of fabrication, structure, properties and applications of Kevlar fibers.

   b) Discuss the preparation, properties and applications of glass reinforced polymer matrix composites.   **(10+10)**

                           OR

4. a) List the various techniques used for the production of polymer matrix composites. Discuss any three in detail.

   b) How do the interfaces in polymer matrix composites control the property of composites ?   **(10+10)**

5. a) Discuss any three fabrication techniques of metal matrix composites.

   b) What are multi-filamentary superconducting composites ? Explain the problem of flux pinning and how it can be overcome. **(12+8)**

                    OR

6. a) Explain (i) thermal and chemical compatibility (ii) interface and toughening mechanism in ceramic matrix composite.

   b) Explain the important characteristics of carbon-carbon composites. How are carbon composites prepared ? **(10+10)**

7. Answer the following questions. **Each** question carries **two** marks.

   a) A composite material consists of 60% by volume of glass fiber and 40% by volume of epoxy resin. The modulus of elasticity of fiber is 131 GPa and that of epoxy is 3.7×10^3 MPa. Calculate the fraction of load carried by the fiber.

   b) What are the advantages of fiber reinforced super alloy composite materials ?

   c) C-C composite can be used as insulating materials in the furnace. Give reason.

   d) Explain the condition under which fiber pullout occurs in a composite.

   e) How does the curing time affect the mechanical properties of polymer matrix composites ?

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