GIET MAIN CAMPUS AUTONOMOUS GUNUPUR – 765022
B. Tech Degree Examinations, May – 2021
(Eighth Semester)
BMEPE8021 – COMPOSITE MATERIALS
(Mechanical Engineering)

Time: 2 hrs   Maximum: 50 Marks

Answer ALL Questions

The figures in the right hand margin indicate marks. Draw neat figures to explain the procedure wherever required. All parts of a question must be answered at one place.

PART – A: (Multiple Choice Questions)   **(1 x 10 = 10 Marks)**

Q.1. Answer *ALL* questions

a. Major load carrier in dispersion-strengthened composites
   (i)   Matrix   (ii)   Fiber
   (iii)   Both   (iv)   Can't define

b. Usually softer constituent of a composite is
   (i)   Matrix   (ii)   Reinforcement
   (iii)   Can't define   (iv)   Both are of equal strength

c. Size range of dispersoids used in dispersion strengthened composites
   (i)   0.01-0.1 µm   (ii)   0.01-0.1 nm
   (iii)   0.01-0.1 mm   (iv)   None

d. Rule-of-mixture provides _____ bounds for mechanical properties of particulate composites.
   (i)   Lower   (ii)   Upper
   (iii)   Both   (iv)   None

e. Al-alloys for engine/automobile parts are reinforced to increase their
   (i)   Strength   (ii)   Wear resistance
   (iii)   Elastic Modulus   (iv)   Density

f. Longitudinal strength of fiber reinforced composite is mainly influenced by
   (i)   Fiber strength   (ii)   Fiber orientation
   (iii)   Fiber volume fraction   (iv)   Fiber length

g. Polymeric materials such as epoxies are formed by strong primary chemical bonds called __.
   (i)   Metallic bond   (ii)   Van der Waals bond
   (iii)   Cross linking   (iv)   Covalent bond

h. What fiber factors contribute to the mechanical performance of a composite?
   (i)   Length   (ii)   Orientation
   (iii)   Shape   (iv)   All of the above.

i. The most common fibers used in advanced polymer composites are
   (i)   glass, steel, and aluminum   (ii)   glass, graphite, and kelvar.
   (iii)   glass, steel, and kelvar.   (iv)   glass, Carbon, and kelvar

j. Which of the following is correct dimensional of flake composites?
   (i)   1-Dimensional   (ii)   2-Dimensional
   (iii)   3-Dimensional   (iv)   4-Dimensional

PART – B: (Short Answer Questions)   **(2 x 5 = 10 Marks)**

Q.2. Answer *ALL* questions

   a. Define Composite material with its characteristics.

   b. Distinguish between Foil, Filament and Mono filament.

   c. What are composites, advanced composites and hybrid composites?

   d. Why particle agglomeration occurs in Stir casting process.

   e. Are Natural fiber hydrophobic or hydrophilic? Explain.

PART – C: (Long Answer Questions)   **(6 x 5 = 30 Marks)**

Answer *ANY FIVE* questions   Marks

3. What is a composite? Explain clearly the function of reinforcement and matrix   (6)
   phase. How the   properties depend on these?

4. Clearly distinguish with sketches particulates, flake and fiber reinforced   (6)
   composites based on their geometry.

5. Explain Microstructural inhomogeneities and particle agglomeration with   (6)
   respect to Vortex method.

6. Explain the Procedure of manufacturing MMCs by Powder Metallurgy process   (6)
   with its advantages & disadvantages and typical applications.

7. Explain with neat sketch the procedure of making parts by Squeeze casting   (6)
   process. Write down its advantages, disadvantages and fields of application.

8. Explain the situations where bottom pouring method is preferred over lip   (6)
   pouring while casting composites.

9. Define interfacial strength for a composite material. Explain the procedure of   (6)
   testing interfacial strength of a FRP composite

10. Calculate the longitudinal modulus and tensile strength of a unidirectional   (6)
    composite containing 60 percent by volume of carbon fiber (E_{1f} =294 GPa and
    σ_{1fu} =5.6 Gpa) in a toughened epoxy matrix (E_m = 3.6 Gpa,
    σ_{mu}=105 Mpa). Compare these values with the experimentally determined
    values of E_1=162Gpa, σ_{1u}=2.94 Gpa. What fraction of the load is carried by
    fibers in the composite?

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