Total No. of Questions : 8]

SEAT No. :

PB3904

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T.E. (Mechanical Engineering)

COMPOSITE MATERIALS

(2019 Pattern) (Semester- II) (Elective-II) (302052A)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data if necessary.***
4) ***Use of electronic pocket calculator is allowed.***

Q1) a) Explain the Squeeze casting process of fabrication of a metal matrix composite in detail. **[6]**

b) Give the advantages and drawbacks of metal matrix composites over polymer matrix composites. **[6]**

c) Describe liquid infiltration process with a neat sketch. **[6]**

OR

Q2) a) Explain interface and wettability of metal matrix composites. **[6]**

b) List three kinds of metal matrix composites and write typical reinforcements used in particle type metal matrix composites. **[6]**

c) Describe with neat sketch the In-situ process of fabrication of a metal matrix composite with its advantages. **[6]**

Q3) a) A glass/epoxy lamina consists of 70% fiber volume fraction. Determine, **[6]**

i) Density of lamina

ii) Mass fractions of the glass and epoxy

iii) The volume of composite lamina if the mass of the lamina is 4 kg.

iv) Volume and mass of glass and epoxy

Take, Density of fiber(ρ_f) is 2500 kg/(m^3,) and density of matrix(ρ_m) is 1200 kg/m^3.

P.T.O.

b) Find the major and minor Poisson's ratio of a glass/epoxy lamina with 70% fiber volume fraction. Take Poisson's ratio of fiber(ϑ_f) is 0.2, Poisson's ratio of matrix(ϑ_m) is 0.3, Young's modulus of fiber(E_f) is 85 GPa and Young's modulus of matrix(E_m) is 3.4 GPa. **[6]**

c) Explain the fatigue property of composite materials. **[5]**

OR

Q4) a) What is a void fraction? What are the properties it governs? **[6]**

b) Derive the rule of mixture equation. **[6]**

c) What do you mean by micro-mechanics and macro-mechanics of lamina? **[5]**

Q5) a) Describe with the help of a neat sketch the fatigue testing of polymer matrix composite. **[6]**

b) Discuss common mechanical tests for composites mentioning the purpose of each test. **[6]**

c) Explain any two non-destructive testing for polymer matrix composites. **[6]**

OR

Q6) a) List the various international and national test standards developed to test mechanical properties of a lamina. **[6]**

b) What is R-curve in fracture toughness test? Interpret its significance in double cantilever beam specimen with the help of load-displacement diagram. **[6]**

c) Sketch the schematic representation of V-Notched beam shear test composite and describe the test with regard to ASTM D5379. **[6]**

Q7) a) State any three advatages and three disadvantages of using glass-Epoxy Composite in Aircraft. **[6]**

b) Write any three reasons why Composites are preferred in sports equipment which composites will be preferred for helmets used in hockey? **[6]**

c) Write any three advantages of Composite material over wood in building a boat? What will be preferred as a resin for building boat? **[5]**

OR

Q8) a) Sate any six properties of Composites that makes it a better material than steel for building application. **[6]**

b) Name the composite that can make the automobile lightweight? State any four advantages of the vehicle being light weight? **[6]**

c) Why is glass/carbon fiber preferred in blade aerofoil of a Light Combat Aircraft? State the significance of Orientation of fiber in the blade aerofoil of a Light Combat Aircraft? **[5]**