Total No. of Questions : 8]

SEAT No. : [ ]

P2321

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[5870]-1029

T.E. (Mechanical/Automobile)

COMPOSITE MATERIALS

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

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) ***Use of a calculator is allowed.***
4) ***Assume suitable data. if necessary.***

Q1) a) Describe the *in-situ* process of fabrication of a metal matrix composite. **[6]**

b) Explain interfaces and wettability of a metal matrix composite. **[6]**

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

OR

Q2) a) Explain with neat sketch the stir-casting process of fabrication of a metal matrix composite in detail. **[6]**

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

c) Give the names of important metallic matrices used as matrix materials and the broad categorization of processes for fabricating metal matrix composites. **[6]**

Q3) a) Derive an expression for longitudinal and transverse Young's modulus and in plane shear modulus of unidirectional composite using mechanics of material approach. **[6]**

b) Write a short note on **[6]**

i) Unidirectional continuous fiber

ii) Discontinuous fiber

iii) Woven reinforcements.

c) Calculate longitudinal and transverse Young's modulus of the composite with 30% fibers by volume. Elastic moduli of glass fibers. And epoxy resin are 70 and 3.5 GPa. respectively. **[5]**

OR

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Q4) a) Derive an expression for volume and weight fraction of composite. **[6]**

b) Explain five ultimate strength parameters of unidirectional lamina. **[6]**

c) Consider a unidirectional reinforced glass fiber/epoxy composite. The fibers are continuous and 60% by volume. The tensile strength of glass fibers is 1 GPa and the 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 tensile strength of the composite in the longitudinal direction. **[5]**

Q5) a) Explain double-cantilever beam test method for measurement of fracture toughness of composite. **[6]**

b) Describe tensile testing of unidirectional composites according to ASTM standard. **[6]**

c) Explain inter-laminar shear strength of composite material in detail. **[6]**

OR

Q6) a) What is the significance of bond strength and adhesion in composite? Explain in detail ASTM F904 for comparison of bond strength or ply adhesion. **[6]**

b) Describe shear testing of unidirectional composites according to ASTM standard. **[6]**

c) What are test standards used in composite materials'? State any six test standards. **[6]**

Q7) a) Explain Multimaterial" concept used in automobile industry with example? **[6]**

b) List and describe the applications of composite for marine applications? **[6]**

c) Write a short note: Eco-friendly prime mover. **[5]**

OR

Q8) a) Write down various applications of composite material in the Aerospace sector and explain use of composite in manufacturing light combat aircraft (LCA) and Light Combat Helicopter LCH? **[6]**

b) Justify the use of Composites in sports equipment and discuss any two applications of composites used for protection of players. **[6]**

c) Elaborate on the applications of Composite for the Transportation Sector. **[5]**