

Total No. of Questions : 8]

SEAT No. :

P2321

[Total No. of Pages : 2

[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]

