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6thSemester Regular / Back Examination 2015-16
COMPOSITE MATERIALS
BRANCH: METTA, MME
Time: 3 Hours
Max Marks: 70
Q.CODE:W519
Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.

Q1 Answer the following questions: **(2 x 10)**
a) What is the function of the matrix?
b) Why are the properties of carbon fibres very anisotropic?
c) What is critical fibre length and how can it be determined?
d) What are the advantages of Metal Matrix Composites over monolithic metals?
e) Compare the creep characteristics of metals and MMCs reinforced with continuous ceramic fibres.
f) Name the different types of bonds that may form at the fibre matrix interface.
g) What are the functions of the faces and the core in sandwich panels?
h) What is a carbon-carbon composite?
i) Mention two characteristic features of aramid fibres.
j) Draw the force displacement curve of pulling a fibre out of the matrix and explain how the fibre pull-out and debonding improve the toughness.

Q2 **a)** Explain the toughening mechanisms in Zirconia Toughened Alumina CMCs. **(5)**
b) Explain the matrix transfer moulding technique of processing CMCs with suitable sketches. **(5)**

Q3 **a)** Give the classification of Composites based on the (i) source, (ii) geometry of reinforcement, (iii) matrix materials. **(5)**
b) Name the different methods employed for fabrication of MMCs and explain the squeeze casting method with suitable diagrams. **(5)**

Q4 Give a comparison of the physical and mechanical properties of MMCs with that of monolithic metals and the variation of these properties with types of reinforcement, proportion of reinforcement and orientation of fibres (angle between tensile axis and fibre axis) in MMCs. **(10)**

Q5 **a)** Derive the expression for elastic modulus for a continuous and aligned fiber-reinforced composite during unidirectional loading parallel to the fibres. **(5)**

b) A continuous and aligned fiber-reinforced composite is to be produced consisting of 45 vol% aramid fibers and 55 vol% of a polycarbonate matrix; mechanical characteristics of these two materials are as follows: **(5)**

	Modulus of Elasticity (MPa)	Tensile Strength (MPa)
Aramid fiber	1.3×10^5	3500
Polycarbonate	2.4×10^3	55

For this composite, calculate (i) the longitudinal tensile strength, and (ii) the longitudinal modulus of elasticity.

Q6 **a)** What is a prepreg? Explain with a neat sketch. Explain the different techniques of making prepregs. **(5)**

b) Explain the autoclave based processing of PMCs with suitable diagram. **(5)**

Q7 **a)** Draw and explain the force displacement curves for (i) monolithic ceramics (ii) particulate reinforced CMCs (iii) fibre reinforced CMCs. **(5)**

b) What are the different liquid state processes for the production of MMCs and explain the liquid melt infiltration under gas pressure technique with suitable diagrams. **(5)**

Q8 Write short notes on any two: **(5 x 2)**
  a) TD-Nickel
  b) Hybrid Composites
  c) Cermets
  d) Pultrusion process