Registration no: | | | | | | | | | | |

Total Number of Pages: 02

M.TECH
MDPE204

Second Semester Mtech Regular/ Back Examination – 2014-15
MECHANICS OF COMPOSITE MATERIALS
BRANCH(S): MECHANICAL SYSTEM DESIGN
Time: 3 Hours
Max marks: 70
Q.CODE:T308

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) Name the different Mechanical physical properties of composites
b) Define Critical Volume Fractions ?
c) What are some of the most commonly used fibre types ?
d) How Orthotropic and Isotropic materials are different?
e) What is critical volume factor of fibers and how it affects the strength of the composite ?
f) How macro mechanical studies and micro mechanical studies are different?
g) What are the assumptions in micro-mechanical studies of composites?
h) What are Hybrid Composites?
i) What is a antisymmetric laminates..
j) Why additives are used in composites materials?.

Q2 a) Classify Composites materials (5)
b) Briefly describe about the advantages of using composite materials. (5)

Q3 a) With neat sketch, briefly describe about filament winding manufacturing method for composite materials. (5)

b) Derive the stress – strain relationship for an anisotropic material. (5)

Q4 a) How does the stress in a discontinuous fiber vary along its length? And explain the factors that must be considered for effective strengthening in discontinuous fibers reinforcement. (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. The Modulus of Elasticity and Tensile Strength of Aramid fiber are 1.3×10^5 MPa and 3500 MPa respectively. The Modulus of Elasticity and Tensile Strength of Polycarbonate are 2.4×10^5 MPa and 55 MPa respectively. For this composite, calculate (5)

(i) the longitudinal tensile strength, and

(ii) the longitudinal modulus of elasticity.

Q5 a) Briefly explain orthotropic materials and anisotropic materials. How they differ? (5)

b) Discuss different failure modes of unidirectional fibre reinforced composites. (5)

Q6 a) Briefly describe about different methods for testing of composites (5)

b) Explain Classical Lamination Theory. (5)

Q7 a) Calculate the ratios of fiber stress to matrix stress and fiber stress to composite stress for un-idirectional composites with for the three cases of V_f = 25%, 50% & 75%. Assume that the composite are loaded in the fiber direction ; E_f = 400 GN/m^2 and E_m = 3.2 GN/m^2. (5)

b) Briefly describe about the design methodologies of structural composites. (5)

Q8 Write short notes on any two: (5x2)

a) Rule of mixture

b) Transformation relationships for a lamina

c) Specific Stiffness of Composites.