R09

Code No: D7611

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH II - SEMESTER EXAMINATIONS, APRIL/MAY 2012
MECHANICS OF COMPOSITE MATERIALS
(AEROSPACE ENGINEERING)

Time: 3hours **Max. Marks: 60**

Answer any five questions
All questions carry equal marks

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1. Classify the composite materials. Discuss the important characteristics of constituent of the composites.

2. a. Discuss any one method of contact moulding method and compression moulding method of producing fiber – reinforced composites.
   b. Discuss the characteristic properties of matrix materials used in fiber – reinforced composites.

3. a. Explain the basic assumptions made in the analysis of laminated composites.
   b. Discuss the biaxial strength criteria for an orthotropic lamina.

4. a. Explain the analysis of thin laminated beam theory.
   b. Discuss different FEM modules used in the analysis of the composites.

5. a. An isotropic material is subjected to a uniaxial stress. Is the strain state also uniaxial? Write the stress and strain in matrix form.
   b. For a ceramic fiber with $\mu = 12\%$, show that $\beta = 10$. Show also that if the fiber length is changed by an order of magnitude, the corresponding drop in the average strength is about 20%.

6. An orthotropic lamina has the following characteristics: E_{11}=210 GPa, E_{12}=8.0 GPa, G_{12}=5.0 GPa, and $\nu_{12} = 0.3$. Consider a three-ply laminate made of such laminate arranged at $\theta = \pm 60^0$. Compute the sub matrices [A], [B], and [D].

7. a. Explain the analysis of thin laminated beam theory.
   b. Discuss different FEM modules used in the analysis of the composites.

8. A graphite/epoxy fiber-reinforced composite material has the following technical constants:
   E_1 = 190 GPa, $E_2 = E_3$ = 10 GPa, G_{12} = 7 GPa, $G_{13} = G_{23}$ = 6 GPa, $\nu_{12} = 0.3$, $\nu_{13}=\nu_{23}=0.2$.
   Find the critical compressive stress σ_{11}^{0ci} acting in the fibers direction and producing the internal (structural) instability of the material.

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