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UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, April, 2017

Program/course: B. Tech MSENT | **Semester – VIII**
Subject: Advanced Materials Technology | **Max. Marks : 100**
Code : MTEG 461 | **Duration : 3 Hrs**
No. of page/s: 02

Note: Assume data if required.

Section A: 5x4 =20 marks (Attempt all questions)

1. Differentiate between cleavage failure and decohesive rupture with the help of neat sketch.
2. Explain Perovskite structure.
3. Describe Fullerenes in brief.
4. Discuss the advantages and disadvantages of using polymers as matrix material.

Section B: 10x4= 40 marks (5,6,7 are mandatory, attempt either 8 or 9)

5. Explain hand lay-up and spray lay- up process.

6. Discuss strengthening mechanisms for metal matrix composites.

7. How alloying provides strength to the material? What will happen if impurity atom has a) larger size than parent atom, b) smaller size than parent atom?

8. For a continuous and oriented fiber-reinforced composite, the moduli of elasticity in the longitudinal and transverse directions are 19.7 and 3.66 GPa, respectively. If the volume fraction of fibers is 0.25, determine the moduli of elasticity of fiber and matrix.

OR

9. A large-particle composite consisting of tungsten particles within a copper matrix is to be prepared. If the volume fractions of tungsten and copper are 0.60 and 0.40, respectively, estimate the upper limit for the specific stiffness of this composite given the data below.

Material	Specific gravity	Modulus of elasticity
Copper	8.9	110 GPa
Tungsten	19.3	407 GPa

Section C: 20 marks each, 10 is mandatory, attempt either 11 or 12

10. a. Define superalloys.
    b. Give classification of superalloys on the basis of main alloying element. What are the different types of precipitates present in superalloys?
    c. Is it possible to improve creep properties by eliminating grain boundaries? Justify.
    d. How directional solidification improves creep properties of an alloy?

11. Derive the expressions for Elastic modulus of fibre reinforced composite when load is applied in a) longitudinal direction, b) transverse direction

OR

12. It is desired to produce an aligned carbon fiber-epoxy matrix composite having longitudinal tensile strength of 750 MPa (109,000 psi). Calculate the volume fraction of fibers necessary if
    (1) the average fiber diameter and length are 1.2×10^{-2} mm (4.7×10^{-4} in.) and 1 mm (0.04 in.), respectively;
    (2) the fiber fracture strength is 5000 MPa (725,000 psi);
    (3) the fiber-matrix bond strength is 25 MPa (3625 psi); and
    (4) the matrix stress at fiber failure is 10 MPa (1450 psi).