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| **Menoufiya University**<br>**Faculty of Engineering**<br>**Shebin El- Kom**<br>**Final Term Exam.**<br>**Academic Year: 2013 – 2014**<br>**Date: 10/ 6/ 2014** |  | **Dept. : Production Engineering**<br>**Year : Fourth Year**<br>**Subject: Advanced Composite Materials**<br>**Code : PRE 425 A**<br>**Time Allowed: 3 hours**<br>**Total Marks: 70 Marks** |
| **Allowed Tables and Charts: None** | | |

**Answer all the following Questions:**

**Question 1:** **(4×5 marks)**

a) Explain the influence of fiber length, fiber orientation and concentration on the properties of composites.

b) List the important factors that must be considered for fabricating MMCs.

c) Why is wetting of the fibers important? What are the two most important aspects that affect wetting of the fibers?

d) Indicate in what way manufacturing using advanced composites is different from the manufacturing using metals.

**Question 2:** **(6+6+8 marks)**

a) Indicate three main functions provided by the matrix in a composite material. Indicate the main function provided by the fiber in a composite material.

b) Explain briefly the stir casting technique for synthesizing discontinuous dispersed reinforced Al-alloy matrix composites.

c) A continuous and aligned fiber-reinforced composite is to be produced consisting of 30 vol % aramid fibers and 70 vol % of a polycarbonate matrix; if the modulus of elasticity of the fibers and the matrix are $1.3 \times 10^5$ & $2.4 \times 10^3$ MPa respectively, and the tensile strengths are 3500 & 55 MPa respectively.

- For this composite compute, the longitudinal tensile strength, and the longitudinal modulus of elasticity.
- Assume that the composite has a cross-sectional area of 320 $mm^2$ and is subjected to a longitudinal load of 44.5 KN. Calculate: i) the actual loads carried by both fiber and matrix phases. ii) the magnitude of the stress on each of the fiber and matrix phases.

**Question 3:** **(3×5 marks)**

a) Demonstrate the four common processing steps in thermoset and thermoplastic composites?

b) Explain why fiberglass-reinforced composites are utilize extensively? Indicate the important types of fiber glasses and the application fields.

**c)** Ceramic-matrix composites are believed to be toughened by three main mechanisms. Explain these mechanisms.

**Question 4:** **(10+5 marks)**

a) Explain (using neat sketch) the injection molding process for making thermoset composites. Explain the differences when it is used for making thermoplastic composites.

b) Define filament winding process, some applications and the limitations of this process.

# Good Luck

| This exam contributes "by measuring ILOs" in achieving Programme Academic Standards according to NARS | | | | | | | | | | | | | | | |
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| **Question Number** | Q1-a | Q2-a | Q3-a | Q4-a | | Q1-c | Q2-c | Q3-c | Q4-b | | Q1-d | Q2-b | Q3-b | Q4-a, | Q4-b |
| **Skills** | a3-1,2 | a3-1,2 | a19-2 | a3-1 | | b13-1 | b13-1 | b2-1, | b2-1 | | c5-1 | c1-1 | c5-1 | c5-1,c16-1 | c5-1,c16-1 |
| | Knowledge & Understanding Skills | | | | | Intellectual Skills | | | | | Professional Skills | | | | |