Ministry of Higher Education& Scientific Research
University of Technology
Materials Engineering Department
Subject: composite materials engineering
Examiner :Dr.Jawad +Dr.Wafaa
Allowed time: 3 hours

وزارة التعليم العالي والبحث العلمي
الجامعة التكنولوجية
قسم هندسة المواد

Final exam/ First Attempt (2014 -2015)
Note :- Answer Four Questions only

Class: 4 th class
Signature :
Date: 10 / 6 / 2015

Q1:- (A) What are the considerations which must be taken in the account of choosing dispersed particles.

(B) Explain briefly the applications of the Laminated Composite Material (25 marks)

Q2 (A) Define the following:

1- Lamina. 2- Nanocomposite. 3- Hybrid Composite

(B) The longitudinal modulus of elasticity for an aligned discontinuous fiber composite is equal to (131 Gpa.), the fibers have a modulus of elasticity of (400 Gpa.) and the matrix modulus of (5 Gpa.), calculate the critical length of the fiber and the volume fraction of the fibers and matrix.

Note: *(Tensile stress) $\sigma f = 1500$ Mpa.* *(Shear stress) $\tau = 30$ Mpa.*
(Fiber diameter) $D = 0.032$ mm *(Fiber length) $L = 2$ mm* (25 marks)

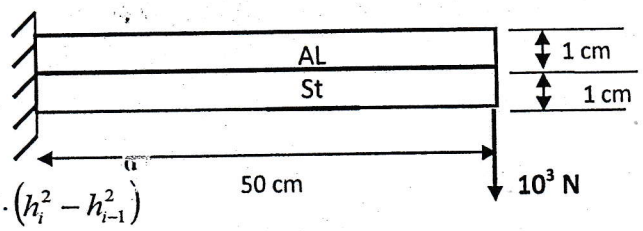
Q3:- (A) Derive the following expression: $$\frac{F_f}{F_m} = \frac{E_f \cdot V_f}{E_m \cdot V_m}$$

Where: Ff , Fm – Applied force on the fibers and matrix respectively.
Ef , Em – Modulus of elasticity of the fibers and matrix respectively.
Vf, Vm – Volume fraction of the fibers and matrix respectively.

(B) Give the advantages and disadvantages of the compression mould. (25 marks)

Q4 :- (A) Find the maximum deflection and the position of the neutral axis of the following Multilayer beam. Also determine the maximum stresses.

Est = 207*105 N/cm2
E_{Al} = 68.6*105 N/cm2
b (width) = 8 cm



Note :-

Position of neutral axis $$y_o = \frac{1}{2} \cdot \frac{\sum_{i=1}^{n} E_i \cdot (h_i^2 - h_{i-1}^2)}{\sum_{i=1}^{n} E_i \cdot (h_i - h_{i-1})}$$

Equivalent Stiffness = $$MR = \frac{b}{6} \cdot \sum_{i=1}^{i=n} E_i \cdot \left[2 \cdot (h_i^3 - h_{i-1}^3) - 3 \cdot y_o \cdot (h_i^2 - h_{i-1}^2)\right]$$

(B) Explain with schematically drawing the stress-strain relationship for a composite and its constituents (25 marks)

Q5 :- (A) A composite specimen has a dimensions with length (5 cm) and width (3 cm) and height (1 cm). Consist of (Al) as a matrix and (Al2O3) particles as a reinforcement. The volume fraction of (Al) matrix was (70 %). Calculate the mass of (Al) and (Al2O3) and the total mass.

Note :-

ρc =3.077 g/cm3	ρm =2.69 g/cm3

(B) What are the factors that effect on the interphase of the composite? (25 marks)

.....GOOD LUCK.....