

Ministry of Higher Education &
Scientific Research
University of Technology
Materials Engineering Department

Subject: Principles of Eng. Mats.
Examiner: Dr. Abbas Khammas
Allowed time: 3 hours



وزارة التعليم العالي والبحث العلمي
الجامعة التكنولوجية
قسم هندسة المواد

Class: 1st
Signature: 
Date: / 6 / 2015

Final Examination (2014-2015)

Answer 5 questions only

Q1 :- (a) A dispersion-strengthened aluminum contains 10 Vol% Al_2O_3 . Assuming that the metal phase is essentially pure aluminum , calculate the density of the composite , where the density of Al_2O_3 is 3.97 mg/m^3 and of aluminum is 2.7 mg/m^3 .

(b) Why composites are important, discuss briefly the advantages and disadvantages of composites (10 marks)

Q2:- (a) What is meant by: Traditional Ceramics, New Ceramics, Thermoplastic, Thermosetting, MMC, CMC, PMC

(b) What are the basic properties of engineering materials ? (10 marks)

Q3 :-Assume the molecular weight distributions shown in table below are for PVC. For this material compute: (a) The number average molecular weight (b) Number average degree of polymerization (c) Weight average degree of polymerization (d) Polydispersity . NOTE: Atomic Weight for C= 12.01 g/mol, H= 1.01 g/mole and for Cl= 35.45 g/mole . (10 marks)

Molecular Weight Range (g/mole)	5000-10000	10000-15000	15000-20000	20000-25000	25000-30000
X_i	0.05	0.16	0.22	0.27	0.20
W_i	0.02	0.10	0.18	0.29	0.26

Q4 :- (a) Calculate the IPF of MgO , which has the NaCl Structure ($r_{Mg}=0.078\text{nm}$, $r_O=0.132 \text{ nm}$)

(b) What are the main types of polymers? Explain briefly . (10 marks)

Q5:- (a) What is meant by rules of averaging under elastic loading for composites (b) What makes polymers unique? (c) Draw within a cubic unit cell the following planes: $(00\bar{1})$, $(\bar{1}\bar{1}\bar{1})$ (10 marks)

Q6 :- (a) What is the classification scheme for various ferrous alloys (b) Explain briefly the general properties of the following non-ferrous alloys: refractory metals, Titanium alloys, Nickel alloys (c) Differentiate between elastic and plastic deformation . (10 marks)

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