


## المستوى الثانى

### علوم المواد

فيزياء رياضية  
 مقرر الفيزياء  
 (فيزياء)

	TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF PHYSICS		
	EXAMINATION OF (LEVEL TWO) STUDENTS OF PHYSICS		
COURSE TITLE:	Mathematical physics 2		COURSE CODE: PH 2261
DATE: 6/6/2017	FINAL EXAM	TOTAL ASSESSMENT MARKS: 100	TIME ALLOWED: 2 HOURS

Answer the following questions:

First question:- (2.5 Marks)

(i) Observe that  $y = x$  is a solution of

$$y'' - [(x + 2)/x]y' + [(x + 2)/x^2] y = 0$$

And solve  $y'' - [(x + 2)/x]y' + [(x + 2)/x^2] y = x e^x$

(ii) Solve  $y'' - 5y' + 6y = x^2 e^{3x}$

Second question:- (2.5 Marks)

Solve (i)  $y'' + 3y' + 2y = e^x - 3$

(ii)  $\Gamma(1/3) \Gamma(2/3) = ??$

(iii)  $\beta(x, y)$  at  $x=4, y=7$

Third question:- (2.5 Marks)

Prove that,  $\Gamma(x+1) = x \Gamma(x)$



Find,  $\int_0^1 x^7 (1-x)^8 dx$ ,  $2 \int_0^{\pi/2} \sin^7(x) \cos^8(x) dx$

Fourth question:- (2.5 marks)

(i) Write about Angular momentum operators

(ii) find,  $x^2 T'' + x T' + (x^2 - 1/4) T = 0$

EXAMINERS	DR. Atef Elbendary
	أطيب التمنيات بالتوفيق

	TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF PHYSICS		
	FINAL EXAM. FOR MATERIALSCIENCE(LEVELTWO )		
	COURSE TITLE: <b>Mechanical Properties</b>	COURSE CODE: MS2232	
DATE: 24/5/2017	SEMESTER:TWO	TOTAL ASSESSMENT MARKS: 100	TIME: 2 HOURS

**Answer the following questions:**

**Question [1] :**

**(20 Mark)**

**Put (√)(1 Mark) or (X) (2 Marks) for the following and then correct the false:**

- a-The response of a material to applied forces depends on the type and nature of the bond and the structural arrangement of atoms, molecules or ions.
- b-Pure shear: Normal Stresses in 3 directions; no Shear Stress.
- c-Directed Stress: Stress that varies with direction.
- d-Ultimate tensile strength: the practical value of the proportional limit; found using the 0.2% offset rule.
- e-Infinitesimal Strain: Strain larger than a few percent.
- f-In brittle materials-little plastic deformation and low energy absorption before fracture.
- g-Ductility is a fundamental property of materials.
- h-Resilience is a measure of the ability of a material to absorb energy up to fracture.
- i-Properties of twinning : small amount of deformation when compared with slip.
- j-Crack propagation is fast Propagates nearly parallel to direction of applied stress.
- k-Brittle fracture is preferred in most applications.
- l-The dislocation energy increases linearly with the Burgers' vector  $b$ .
- m-As temperature increases a brittle material can become ductile.

**Question [2] :**

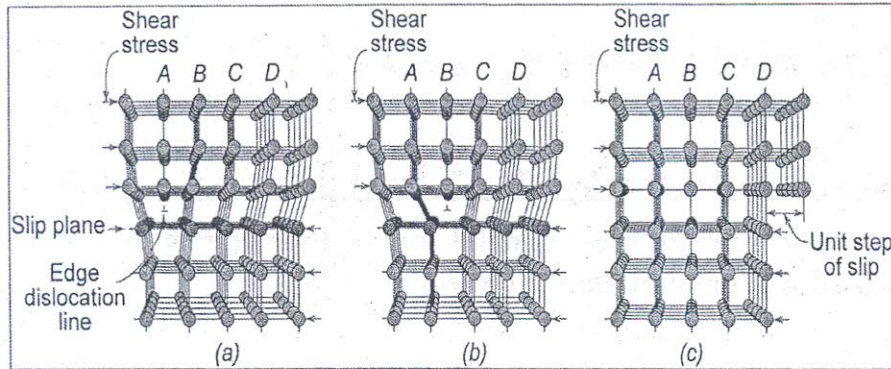
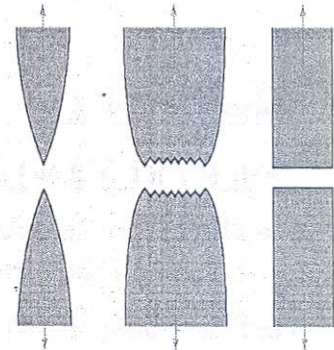
**(30 Mark)**

**Write short notes about the following:**

- (i) -Stress - Strain Curve. **(10 Marks)** & (ii)- Basic deformation types for load carrying materials. **(10 Marks)** & (iii)-Modulus of Rigidity. **(10 Mark)**

**Question [3] :****(26 Mark)****a-Explain the following:****(10 Mark)**

-Plastic deformations in polycrystalline metals.

**b-Describe the following Figures:****(16 Mark)****Fig.1****Fig.2****Question [4] :****(24 Mark)****Problems:**

1-(a) A 10-mm-diameter Brinell hardness indenter produced an indentation 2.50 mm in diameter in a steel alloy when a load of 1000 kg was used. Compute the HB of this material.

(b) What will be the diameter of an indentation to yield a hardness of 300 HB when a 500-kg load is used? **(6 Marks)**


2-A 2kg mass is hung from a steel wire of original length 2m and diameter 0.64mm. The extension produced is 0.60mm. Calculate Young's modulus for steel. ( $g=10\text{m/s}^2$ ).

**(6 Marks)**

3-Compute the strain-hardening exponent  $n$  for an alloy in which a true stress of 50,000 psi produces a true strain of 0.08; assume a value of 140,000 psi for  $K$ . **(6 Marks)**

4-A 5.00-cm cube of gelatin has its upper surface displaced 1.00 cm by a tangential force 0.500 N. What is shear modulus of this substance?

**(6 Marks)****Examiner****Dr. Samy El-Attar.****Good luck****Mechanical Properties(MS2232) →24-05-2017****انظر خلف الصفحة**

	TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF PHYSICS		
	SECOND YEAR (MATERIAL SCIENCE)		
COURSE TITLE:	تيار متردد		COURSE CODE: MS2242
DATE: 31-5-2017	TERM: SECOND	TOTAL ASSESSMENT MARKS: 100	TIME ALLOWED: 2 HOUR

Please Answer the Following:

Question (1):

- (a) Define the effective current and derive its formula for a sinusoidal A.C. current.
- (b) Plot a schematic of the oscilloscope.
- (c) Calculate using the vector method the total impedance and the phase angle of R, L, C in series.

(25Marks)

Question (2):

- (a) Calculate the current across and the impedance of the giving circuit in fig (1).
- (b) Find the equilibrium conditions of Hay Bridge as shown in fig (2).

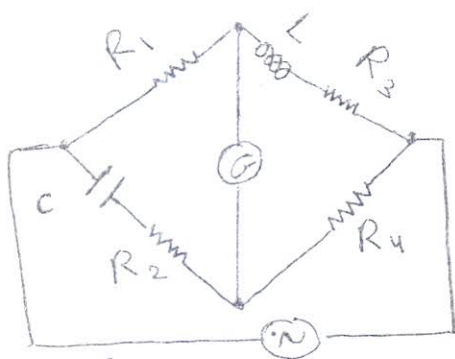


Fig (2)

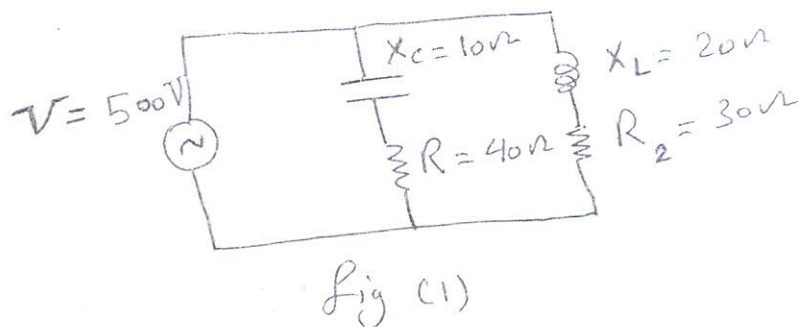


Fig (1)

(25Marks)

Question (3):

- (a) Explain the half wave rectifier and calculate the DC average voltage.
- (b) Resonance ac circuit consists of a coil, a capacitor, and a resistance in series. The self-inductance of the coil is  $100 \mu H$ . The capacitance of the capacitor is  $0.0001 \mu F$  and the resistance is  $10 \text{ Ohm}$ . If the applied voltage across the circuit is  $0.1 \text{ volt}$ , calculate the resonance frequency and the voltage across the coil and the capacitance.

(25Marks)

Question (4): Write short notes on:

- (a) The diode approximations.
- (b) Characteristic curve of a diode.
- (c) Energy bands.

(25Marks)



2-a) How will you determine the wave length by using Michelson interferometer.

b) In Newton's ring experiment , if drop of water ( $n=1.33$ ) be placed in between the lens and the plate , the diameter of 10<sup>th</sup> ring is found to be 0.6 cm , obtain the radius of curvature of the face of the lens in contact with the plate. ( $\lambda$  of light used 6000A)

3- Derive an expression for the intensity at a point in the Fraunhofer type of diffraction produced by N nearby parallel narrow slits illuminated by monochromatic light.

4- a) Give three methods producing plane polarized light .

b) Calculate the least width of a plane diffraction grating having 500 line /cm which will just resolve in the second order the sodium lines of wavelength 5890 and 5896 A<sup>0</sup>

Good luck .....

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2184

	TANTA UNIVERSITY- Faculty of Science -Department of Physics			
	EXAM FOR LEVEL TWO STUDENTS OF PHYSICS AND MATERIAL SCIENCE			
	COURSE TITLE	Electromagnetism2		COURSE CODE: 2184
DATE:	27-5-2017	TERM: SECOND	TOTAL ASSESSMENT MARKS: 100	TIME ALLOWED: 2 HOURS

First Question:

- 1- Find the relation between the current density ( $J$ ) and the velocity of volume charge density ( $\rho_v$ ). (10Markes)
- 2- By using an appropriate closed path and Gaussian surface find the boundary conditions equation at the interface between two perfect dielectric materials. (15Markes)

Second Question:

- 1- (a) Solve Laplace's equation for the potential in the homogeneous region between two concentric conducting spheres with radii  $a$  and  $b$ ,  $b > a$  if  $V=0$  at  $r=b$ , and  $V = V_0$  at  $r=a$ .  
(b) find the capacitance between them. (10Markes)
- 2- Given the potential field  $V = (A\rho^4 + B\rho^{-4}) \sin 4\phi$ :  
a) Show that  $\nabla^2 V = 0.0$ .  
b) Select  $A$  and  $B$  so that  $V = 100V$  and  $|E| = 100 V/m$  at  $P$  ( $\rho = 1, \phi = 22.5^\circ, z = 2$ ). (15Markes)

Third Question:


- 1- Define Biot- Savart law, then using it deduces the magnetic field around:  
(a) long filament carrying current  $I$ , (b) Limited filament carrying current  $I$ . (20Markes)
- 2- Find the current density ( $J$ ) inside and outside long filament carrying current  $I$ . (10Markes)

Forth Question:

- 1- State and explain the four Maxwell equations in the static conditions. (10Markes)
- 2- Evaluate both sides of Stokes' theorem for the field  $G = 10 \sin \theta a_\phi$  and the surface  $r=3$ ,  $0 \leq \theta \leq 90^\circ, 0 \leq \phi \leq 90^\circ$ . let the surface have the  $a_r$  direction. (10Markes)

Examiner

Dr: Reda El Shater

	اختبار نهائي فيزياء حديثة الفصل الثاني للعام الأكاديمي ٢٠١٦-٢٠١٧ ١٠٠ درجة الزمن ساعتان تاريخ الامتحان ٢٠١٧/ ٦/٣	جامعة طنطا كلية العلوم قسم الفيزياء
	اسم الطالب	

ثابت بلانك =  $6.62 \times 10^{-34}$  شحنة الإلكترون =  $1.6 \times 10^{-19}$  كولوم  
 كتلة الإلكترون  $9.1 \times 10^{-31}$  Kg  
 ثابت كولوم  $K = 9 \times 10^9$

### First question

(12 marks)

#### Choose the correct answers after each sentences:

1- The work function of Cu is 4.7ev , the photon frequency needed to produce photo electrons with  $E_{\max} = 10\text{ev}$  is

أ -  $3.55 \times 10^{15} \text{Hz}$  - ب -  $3.55 \times 10^{11} \text{Hz}$  - ج -  $5.35 \times 10^{13} \text{Hz}$  - د -  $5.35 \times 10^{10} \text{Hz}$

2- A photon with wavelength  $\lambda = 0.7 \text{A}$  make a collision with rest electron , after collision its wavelength becomes  $\lambda = 0.724 \text{A}$ , the K.E of electron is

أ - 825ev - ب - 288ev - ج - 588ev - د - 385ev

3- The  $\lambda_{\max} = 4900 \text{A}$  for solar radiation, the temperature of sun surface is (Wien constant  $b = 2.9 \times 10^{-3}$ )

أ - 5918k - ب - 9517k - ج - 1859k - د - 8591k

4 - Kinetic energy of the electron, which must possess in order to have 1A wavelength associated with the movement .

أ - 510ev - ب - 150ev - ج - 250ev - د - 350ev

### Essay questions:

#### second question

(32 marks)

1- Prove that the length L contracts when moving by velocity V

2- Prove that  $\phi_0 = h\nu_0$  where  $\nu_0$  is threshold frequency for photoelectric emission and  $\phi_0$  the work function.

3-a- Prove That  $k = [1 + \frac{1}{2} \frac{v^2}{c^2}]$  if  $c \gg v$

b- Prove that the relative and classical kinetic energy are the same when  $c \gg v$ .

h انظر خلف الورقة



**Third question**

( 36 marks)

a-Prove that the particle velocity is given by  $v = c \left[ \sqrt{1 - \left(\frac{E_0}{E}\right)^2} \right]$

Where E and  $E_0$  are the total and rest energies respectively.

b-From conservation of energy and momentum, Compton obtain the equation  $m_0 c^2 (\gamma - \gamma') = h\gamma\gamma'(1 - \cos\phi)$ . Determine  $\Delta\lambda$  as a function of scattering angle  $\phi$ .

**The fourth question**

(20 marks)

a- Diffraction of the first order of the electrons with energy 54eV occurs from Ni crystal of interlayer distance  $d = 2.15 \text{ \AA}$  at the diffraction angle  $\theta = 50^\circ$ . Calculate the wavelength associated by considering the electron is a wave and then as a particle.

b- Prove that when the electron-positron is annihilated, two photons are produced with the same energy.