




## المستوى الثالث

### فيزياء

بسم الله الرحمن الرحيم


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	TANTA UNIVERSITY FACULTY OF SCIENCES DEPARTMENT OF PHYSICS			
	EXAMINER: <i>PROF. DR. RYAD A.M. GHAFY</i>			
	COURSE TITLE:	<i>Laser physics (Physics &amp; Biophysics students)</i>	CODE: 3222	
DATE:	4 JUN, 2017	TERM: SECOND	TOTAL MARKS: 200	PERIOD: 2 HOURS

Answer the following questions :-

- 1- Derive the expression of the population inversion under steady-state oscillation  $\Delta N_{th}$  as a function of transition probability  $|\mu_{21}|^2$
- 2- The laser beam has some special physical properties, write- down and give a short account about each of them?
- 3- Explain physically the laser action in terms of the rate equations theory?
- 4- Find the relationship between the gain coefficient  $G$  and the loss coefficient  $L_{eff}$  in the laser resonator?

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	TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF PHYSICS			
	EXAMINATION OF (LEVEL THREE) STUDENTS OF PHYSICS			
	COURSE TITLE:	Mathematical physics 3		COURSE CODE: PH 3264
DATE:	8/6/2017	FINAL SECOND TERM EXAM	TOTAL ASSESSMENT MARKS: 100	TIME ALLOWED: 2 HOURS

**Answer the following questions:**

**First question:- (25 Marks)**

- (i) Show that the function  $f(z) = x^2 - y^2 + 2ixy$  is differentiable for all values of  $z$ .
- (ii) Find the transformer matrix  $L$  corresponding to a rotation of the coordinate axis through an angle  $\theta$  about the  $e_3$ - axis.

**Second question: - (25 Marks)**

-The sample of five values for the weight of different student given as: 2, 3, 5, 8, 9.

- (i) Find ; the geometric mean, and harmonic mean.
- (ii) Find ; the sample variance and sample standard deviation of the data.

**Third question:- (25 Marks)**

- The student of fourth year at physics department selected random and their height and weights are found as follows,

Height (m)	1.6	1.64	1.7	1.8	1.82	1.77
Weight (kg)	75	80	89	95	93	90


Calculate the sample correlation between the heights and weights.

**Fourth question:-**

**(25 Marks)**

Find the Fourier series expansion of the function  $f(x) = x^2$  for,  $0 < x \leq 2$ .

EXAMINERS	DR. Atef Elbendary
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	TANTA UNIVERSITY			
	FACULTY OF SCIENCE			
	DEPARTMENT OF PHYSICS			
	THIRD YEAR (PHYSICS)			
COURSE TITLE:	Quantum mechanics II			COURSE CODE: PH3232
DATE:	24-6- 2017	TERM: SECOND	TOTAL ASSESSMENT MARKS:150	TIME ALLOWED: 2 HOUR

Please Answer the Following:

Question 1: Put true or false and comment on the false statements:

- 1) The wave-function completely specifies the state of a quantum system.
- 2) The photon is a quantization of vibration motion.
- 3) The eigenfunctions of Hermitian operators are orthogonal.
- 4) The convergence of the perturbation theory requires that the magnitude of high order corrections must be larger than the zero order.
- 5) Non-commute operators have simultaneously measurable eigenvalues.
- 6) The four quantum numbers are derived during the solution of Schrödinger equation of Hydrogen atom.
- 7) The components of the orbital angular momentum are not simultaneously measurable.
- 8) Quantum mechanics as well as classical mechanics predicts that the spectrum of harmonic oscillator is continuous.
- 9) The exact solution of Schrodinger equation for He and Na atoms is analytically feasible as the solution of hydrogen atom.
- 10) The energy of an electron hydrogen atom derived from Schrödinger equation is not like the results of Bohr theory.
- 11) In perturbation theory, the first order correction is calculated from the state function of zero-order.

(45 Marks)

Question 2: (a) Plot a schematic of the energy-level diagram of atomic hydrogen.

(b) Derive the energy of even states of a harmonic oscillator starting from Hermite equation:

$$\frac{d^2 H}{d\xi^2} - 2\xi \frac{dH}{d\xi} + (\lambda - 1)H = 0,$$

and using the power series method.

(30 Marks)

باقى الاسئلة فى الصفحة التالية



**Question 3:** (a) Define the orbital angular momentum and find  $[L_x, L_y]$  and  $[L^2, L_z]$ .

(b) Assume that the lowest eigenfunction of the simple harmonic oscillator is approximated by  $\psi_0 = N e^{-c x^2}$ , where N is the normalization constant and c is the variational parameter. Use the variational method to determine c and calculate the energy associated with lowest eigenfunction.

c) Derive the wave function of an electron in a Hydrogen atom when its radius tends to infinity. (45 Marks)

**Question 4:** (a) Derive the first order energy correction using time-independent perturbation theory of a non-degenerate energy level.


(b) Write short notes on the difference between quantum mechanics and classical mechanics in treating particle collisions, the importance of quantum collision theory in microscopic physics, and the method of partial waves.

(30 Marks)

**Note:** In spherical coordinate:

$$\nabla^2 = \frac{1}{r^2} \frac{\partial}{\partial r} r^2 \frac{\partial}{\partial r} + \frac{1}{r^2 \sin(\theta)} \frac{\partial}{\partial \theta} \sin \theta \frac{\partial}{\partial \theta} + \frac{1}{r^2 \sin^2(\theta)} \frac{\partial^2}{\partial \phi^2}$$

☺ ☺ Best Wishes ☺ ☺  
Dr. Mohammed Shihab


	TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF PHYSICS			
	FINAL EXAMINATION FOR FRESHMEN (THIRD LEVEL) MATERIAL SCIENCE STUDENTS (SEMESTER 2) شعبة علوم المواد طلاب المستوى الثالث			
	COURSE TITLE:	ANALOG ELECTRONICS الالكترونيات تناظرية	COURSE CODE: MS3252	
DATE:	JUNE 2017	TERM: SECOND	TOTAL ASSESSMENT MARKS: 150	TIME ALLOWED: 2 HOURS

**Answer the following questions:-**

- 1- Calculate the necessary capacitor to design a power supply 10 V, that can supply a resistor 100  $\Omega$ , if the ripples must not exceed 0.1 volt. Draw the circuit.
- 2- a- What we mean by saturated transistor and cutoff transistor.  
  
b- A transistor circuit with the following  $R_C = 5 \text{ K}\Omega$ ,  $R_E = 500 \Omega$ ,  $V_{CC} = 15 \text{ V}$ , what is the ratio between divider resistors necessary to saturate the transistor ? Draw the circuit.
- 3- a- Compare between JFET, MOSFET, SCR and Triac.  
  
b- Draw a circuit to control the power in heater.
- 4- a- Explain a circuit to protect a load against over voltage.  
  
b- Draw a circuit to give positive pulses. Explain your drawing.

***With my best wishes***

Examiners	Prof. Mostafa K. Elnimr
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	TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF PHYSICS			
	EXAMINATION of <b>(Third)</b> students OF <b>Physics</b> group			
	COURSE TITLE:	Nuclear Physics	COURSE CODE:PH3262	
DATE:	30 / 5 / 2017	TERM: SECOND	TOTAL ASSESSMENT MARKS :100	TIME ALLOWED: 2 HOURS

**Answer the following questions:**

**1- Explain and deduce the terms of specific binding energy by using the liquid drop model. (25 Marks)**

**2-a) By using successive decay, obtain the number of daughter radioactive nuclei. (15 Marks)**

**b) The activity of radioactive material decrease by 8 in time (30 d). Calculate the decay constant and mean life time. (10Marks)**

**3-a) Draw the energy states and Compute the spin and parity for these nuclei in ground state and find isospin for nuclei  ${}^{16}_7\text{N}$ ,  ${}^{19}_8\text{O}$ ,  ${}^{26}_{13}\text{Al}$  (15Marks)**

**b) Calculate the binding energy of  $\alpha$ -particle in the nucleus  ${}^{16}_8\text{O}$ . (10Marks)**

**4-a) Prove that all nuclei have approximately the same density . (10Marks)**

**b) Calculate the atomic masses of  ${}^{147}_{61}\text{Pm}$ ,  ${}^{147}_{62}\text{Sm}$ , hence show that  ${}^{147}_{61}\text{Pm}$  decays by  $\beta^-_{\text{max}}$  emission and calculate the energy of  $\beta^-_{\text{max}}$  (15Marks)**

$$\text{B.E}({}^{147}_{61}\text{Pm})=1217.85\text{MeV}, \text{B.E}({}^{147}_{62}\text{Sm})=1217.29\text{MeV}$$

$$\text{Hint: } N_A=6.023 \times 10^{26} (\text{kg mol})^{-1}, M({}^{16}_8\text{O})=15.994915\text{u}, M(\text{P})=1.007825\text{u}$$

$$M(\text{n})=1.008665\text{u}, M({}_2^4\alpha)=4.002603\text{u}, \text{Radius of nucleon } r_0=1.4\text{F.}$$

EXAMINER	Prof. Dr. Neima Zakaria Darwish
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<div style="display: flex; align-items: center;"> <div style="text-align: center;"> <b>TANTA UNIVERSITY</b>  <b>FACULTY OF SCIENCE</b>  <b>DEPARTMENT OF PHYSICS</b> </div> </div>				
<b>EXAMINATION OF JUNIORS (THIRD YEAR) STUDENTS OF MATERIAL SCIENCE</b>				
<b>COURSE TITLE:</b>	<b>LASER SPECTROSCOPY</b>			<b>COURSE CODE: MS3222</b>
<b>DATE:</b>	<b>25/05/2017</b>	<b>TERM: SECOND</b>	<b>TOTAL ASSESSMENT MARKS: 100</b>	<b>TIME ALLOWED: 2 H</b>

ANSWER THE FOLLOWING QUESTIONS

**Q1- (25 Marks)**

A) Prove that:

**(15 Marks)**

$$\frac{\text{Rate of stimulated emission}}{\text{Rate of spontaneous emission}} = \frac{\rho(\nu)B_{21}N_2}{A_{21}N_2} = \frac{1}{(e^{h\nu/kT} - 1)}$$

Where  $B_{21}$  is the Einstein B coefficient of stimulated emission;  $A_{21}$  is the Einstein A coefficient;  $\rho(\nu)$  is the energy density per unit frequency;  $N_2$  is the population of the excited state;  $\nu$  is the frequency;  $h$  is Planck constant;  $k$  is Boltzmann constant and  $T$  is the absolute temperature.

B) Find the ratio of the rate of spontaneous emission to the rate of stimulated emission for a medium at a temperature of 1000 K and wavelength of 500 nm. ( Planck constant =  $6.6 \times 10^{-34}$  J.s, Boltzmann constant =  $1.38 \times 10^{-23}$  J/K)

**(10 Marks)**

**Q2- (25 Marks)**

A) Derive the amount of gain per pass in an active medium placed between two mirrors if the incident photon flux is  $F$  and the length of the active medium is  $L$ .

**(15 Marks)**

B) The distance from Earth surface to Moon surface is  $3.84 \times 10^5$  km . What beam divergence is needed for a beam to expand to 1 km on the surface of the moon?

**(10 Marks)**

**Q3- (25 Marks)**

A) Write about directionality and coherence of the laser.

**(15 Marks)**

B) The beam from a ruby laser ( $\lambda = 694$  nm) is sent to the moon after passing through a telescope of 1 m diameter. Calculate the beam diameter  $D$  on the moon assuming that the beam has perfect spatial coherence (the distance between earth and moon is approximately 384,000 km).

**(10 Marks)**

**Q4- (25 Marks)**

A) What is meant by "Laser spectroscopy"?

**(5 Marks)**

B) What does LIBS refer to? And what are the advantages and disadvantages of LIBS?

**(10 Marks)**

C) Write briefly about Doppler broadening.

**(10 Marks)**

EXAMINERS	ASS. PROF. MOHAMED SHAHEEN
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TANTA UNIVERSITY  
FACULTY OF SCIENCE  
DEPARTMENT OF PHYSICS

EXAMINATION FOR THRID YEAR PHYSICS

COURSE TITLE:

ELECTRONICS AND DEVICES

PH 3252

DATE: 11- 6- 2017

MARKS:

100


TIME 2 HOURS

**Answer all the following questions:**

- 1-(A) Discuss the construction, operation, and characteristic curves of Field Effect Transistor (FET ) (15 Marks)
- (B ) Draw and Discuss one of FET applications (10 Marks)
- 2-(A) Discuss and drive the Miller theorem for an amplifier with feed back impedance  $Z$  connected between input and output (10 Marks)
- (B ) Discuss the effect of capacitors and transistor **inter-electrode** capacitance on the frequency response of a transistor amplifier and show its response **only** in case of **Mid** and **High frequency** signals (15 Marks)
- 3- (A) Find the condition that must be satisfied for the value of a load  $R_L$  connected by a voltage source with resistance  $R_s$  to get maximum power in the load (10 Marks)
- ( B ) Draw a **Common Collector** small signal transistor amplifier and solve its equivalent circuit for different parameters and show the importance of such transistor configuration (15 Marks)
- 4-(A) Write the different types of Feed Back classifications and drive the general relation between gains **with** and **without** feed back (10 Marks)
- (B) Just write the different possible advantages of **Negative** Feed Back in amplifier circuits and **prove only any two cases**. (15 Marks)

Examiner	Dr. Mahmoud Kamel
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 1989	<b>TANTA UNIVERSITY- Faculty of Science -Department of physics</b>			
	<b>EXAMINATION FOR LEVEL3 STUDENTS OF BIOPHYSICS</b>			
	<b>COURSE TITLE:</b>	<b>Electrodynamics II</b>		<b>COURSE CODE: PH3272</b>
<b>DATE:</b>	<b>15 JUNE 2017</b>	<b>TERM: SECOND</b>	<b>TOTAL ASSESSMENT MARKS: 100</b>	<b>TIME ALLOWED: 2 HOURS</b>

**ANSWER THE FOLLOWING QUESTIONS:**

- 1- A- Define by equations only : (15 Marks)
- a- The magnetization  $\mathbf{M}$  in terms of the magnetic dipole moment.
  - b- The magnetization  $\mathbf{M}$  in terms of the applied field.
  - c- The bound current  $I_b$  in terms of magnetization.
  - d- The bound current  $I_b$  in terms of the bound current density.
  - e- The magnetic flux density  $\mathbf{B}$  in terms of magnetization and applied magnetic field.

**B- Show how Maxwell had added a correction term to Ampere's circuital law and what is the physical meaning of that term? (10 Marks)**

- 2- a-Write Maxwell's equations in vacuum where there is neither charge nor current.(10 Marks)  
b- From these equations prove that the cartesian components of  $\mathbf{E}$  and  $\mathbf{B}$  satisfy the general form of wave equation. (10 Marks)

**c- Finally, calculate the velocity of propagation** of electromagnetic waves in vacuum.  
( $\epsilon_0 = 8.85 \times 10^{-12}$  F/m and  $\mu_0 = 4\pi \times 10^{-7}$  H/m). **(5 Marks)**

- 3- a- **Define** the Hall voltage and illustrate its direction for both positive and negative charges in motion ( **use a schematic diagram** to clarify your answer). **(15 Marks)**  
b- **State Lorentz equation** which describes the force on a moving charged particle due to combined electric and magnetic fields. **(4 Marks)**

c- **Mention some practical cases** in which the solution of this equation is used. **(6 Marks)**

- 4- a-Choose the right statement from between the brackets: (16Marks)

1. For a force which is always applied in a direction at right angles to the direction in which a charged particle is proceeding, it { **can easily - can never** } change the magnitude of the particle velocity.
  2. Concerning the boundary conditions between two different magnetic materials, the normal component of  $\mathbf{B}$  is given by:  $\mathbf{B}_{N2} = \{ \mathbf{B}_{N1} - (\mu_1/\mu_2)\mathbf{B}_{N1} \}$
  3. In antiferromagnetic materials at room temperature, the magnetic susceptibility is { **zero - small and positive** }
  4. The velocity of propagation of an electromagnetic wave in a medium is determined by { **the source of the wave - the medium of propagation** }
  5. In a uniform magnetic flux density, the total algebraic force on a closed filamentary circuit in a uniform magnetic field ( **must be - cannot be** ) zero and the torque generally ( **must be - may not be** ) zero.
  6. An electron in an orbit is analogous to a small current loop; in which the current is directed ( **in the same - in opposite** ) direction of electron travel.
  7. An electron in an orbit is analogous to a small current loop and therefore experiences a ( **polarization - torque** ) in an external magnetic field.
- b- **Define:** The skin depth – the displacement current. (4 Marks)
- c- Show how you can define a scalar magnetic potential such that your definition do not conflict with the previous known laws of the magnetic field. (5 Marks)

EXAMINERS	PROF. DR. S. A. SAAFAN ☺☺☺☺☺☺☺☺ BEST WISHES
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TANTA UNIVERSITY- Faculty of Science -Department of physics

EXAMINATION FOR LEVEL 3 STUDENTS OF PHYSICS

COURSE TITLE:

Electrodynamics II

COURSE CODE: PH3272

DATE:

15 JUNE 2017

TERM: SECOND

TOTAL ASSESSMENT MARKS: 100

TIME ALLOWED: 2 HOURS

**ANSWER THE FOLLOWING QUESTIONS:**

**1- A- Define by equations only :**

**(15 Marks)**

- a- The magnetization  $\mathbf{M}$  in terms of the magnetic dipole moment.
- b- The magnetization  $\mathbf{M}$  in terms of the applied field.
- c- The bound current  $I_b$  in terms of magnetization.
- d- The bound current  $I_b$  in terms of the bound current density.
- e- The magnetic flux density  $\mathbf{B}$  in terms of magnetization and applied magnetic field.

**B- Show how Maxwell had added a correction term to Ampere's circuital law and what is the physical meaning of that term?**

**(10 Marks)**

**2- a-Write Maxwell's equations in vacuum** where there is neither charge nor current.**(10 Marks)**

**b- From these equations prove that the cartesian components of  $\mathbf{E}$  and  $\mathbf{B}$  satisfy the general form of wave equation.**

**(10 Marks)**

**c- Finally, calculate the velocity of propagation of electromagnetic waves in vacuum.**

( $\epsilon_0 = 8.85 \times 10^{-12}$  F/m and  $\mu_0 = 4\pi \times 10^{-7}$  H/m).

**(5 Marks)**

**3- a-Define the Hall voltage and illustrate its direction for both positive and negative charges in motion ( use a schematic diagram to clarify your answer).**

**(15 Marks)**

**b- State Lorentz equation** which describes the force on a moving charged particle due to combined electric and magnetic fields.

**(4 Marks)**

**c- Mention some practical cases** in which the solution of this equation is used.

**(6 Marks)**

**4- a-Choose the right statement from between the brackets:**

**(16 Marks)**

1. For a force which is always applied in a direction at right angles to the direction in which a charged particle is proceeding, it { **can easily - can never** } change the magnitude of the particle velocity.
2. Concerning the boundary conditions between two different magnetic materials, the normal component of  $\mathbf{B}$  is given by:  $\mathbf{B}_{N2} = \{ \mathbf{B}_{N1} - (\mu_1/\mu_2)\mathbf{B}_{N1} \}$
3. In antiferromagnetic materials at room temperature, the magnetic susceptibility is { **zero - small and positive** }
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5. In a uniform magnetic flux density, the total algebraic force on a closed filamentary circuit in a uniform magnetic field ( **must be - cannot be** ) zero and the torque generally ( **must be - may not be** ) zero.
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**b- Define:** The skin depth – the displacement current.

**(4 Marks)**

**c- Show how you can define a scalar magnetic potential such that your definition do not conflict with the previous known laws of the magnetic field.**

**(5 Marks)**

EXAMINERS

PROF. DR. S. A. SAAFAN ☺☺☺☺☺☺☺☺ BEST WISHES



<div style="display: flex; align-items: center;"> <div> <b>Tanta University- Faculty of Science-Department of Physics</b>  <b>Examination for Senior (Third level) Students of Biophysics</b> </div> </div>				
	<b>Course title</b>	<b>Signals analysis and processing in biosystems</b>		<b>course code: BP3260</b>
<b>Date:</b>	<b>18 / 6/ 2017</b>	<b>term: 2st</b>	<b>Total assessment marks: 100</b>	<b>Time allowed: 2hours</b>

### First question

Solve the following problems (25 marks)

What is the Nyquist frequency for this signal for the analogue signal?

A)  $x(t) = 5\cos 50t + 3\sin 100t + \cos 150t$  (5 marks)

B)  $x(t) = 3\cos 50\pi t + 10\sin 300\pi t + \cos 100\pi t$  (5 marks)

C) For the following sequences:  $a[n] = \{-2 \ 3 \ 1 \ -5 \ -8\}$ ,  $-3 \leq n \leq 1$ ;  
 $b[n] = \{-2 \ 0 \ 7 \ 6 \ -1\}$ ,  $-1 \leq n \leq 3$ . Find the sequence  $c[n] = a[n] + b[-n-2]$ . (10 marks)

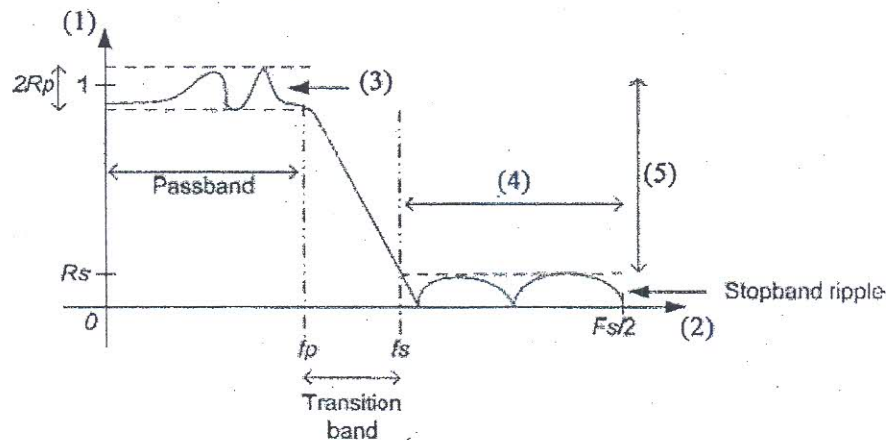
### Second question (25 marks)

Write the mathematical formula for the following:

- |                                |  |
|--------------------------------|--|
| 1- Discrete Fourier transforms | 2- Inverse Discrete Fourier transforms |
| 3- Triangle windows            | 4- Finite impulse response             |
| 5- Asymmetry ratio             |  |

### Third question (25 marks)

A) Define each number in the figure of low pass filter




### Fourth question (25 marks)

How can you use AR model to predict values of a signal,  $x = [0.58 \ 0.42 \ 0.52 \ 0.33 \ 0.43 \ 0.26 \ 0.58 \ 0.76 \ 0.53 \ 0.64]$ ; the AR coefficients of order 3 are  $A = [-0.46 \ -0.41 \ -0.10]$ . Predict only the value for  $x[10]$ .

Good luck

Prof.Dr Fathy El-hussiny

Dr. Reda Morsy

<div><div>Tanta University- Faculty of Science-Department of Physics Examination for Senior (Third level) Students of Biophysics</div></div>				
Course title		Signals analysis and processing in biosystems		course code: BP3260
Date:	18 / 6/ 2017	term: 2st	Total assessment marks: 100	Time allowed: 2hours

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### Second question (25 marks)

Write the mathematical formula for the following:

1- Discrete Fourier transforms

2- Inverse Discrete Fourier transforms

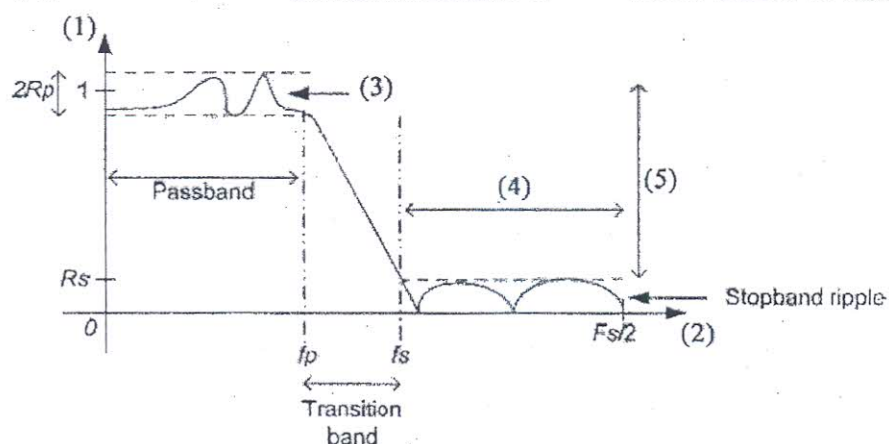
3- Triangle windows

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### Third question (25 marks)

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Good luck

Prof.Dr Fathy El-hussiny

Dr. Reda Morsy

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	<b>Course title</b>	<b>Signals analysis and processing in biosystems</b>	<b>course code: BP3260</b>	
<b>Date:</b>	<b>18 / 6/ 2017</b>	<b>term: 2st</b>	<b>Total assessment marks: 100</b>	<b>Time allowed: 2hours</b>

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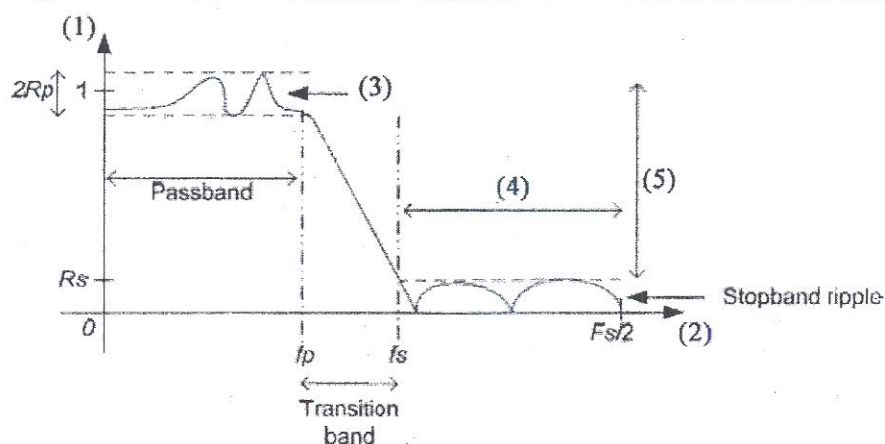
### Second question (25 marks)

Write the mathematical formula for the following:

- |                                |  |
|--------------------------------|--|
| 1- Discrete Fourier transforms | 2- Inverse Discrete Fourier transforms |
| 3- Triangle windows            | 4- Finite impulse response             |
| 5- Asymmetry ratio             |  |

### Third question (25 marks)

A) Define each number in the figure of low pass filter




### Fourth question (25 marks)

How can you use AR model to predict values of a signal,  $x = [0.58 \ 0.42 \ 0.52 \ 0.33 \ 0.43 \ 0.26 \ 0.58 \ 0.76 \ 0.53 \ 0.64]$ ; the AR coefficients of order 3 are  $A = [-0.46 \ -0.41 \ -0.10]$ . Predict only the value for  $x[10]$ .

Good luck

Prof.Dr Fathy El-hussiny  
Dr. Reda Morsy



	TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT F PHYSICS				
	EXAMINATION THIRD YEAR FRESH STUDENTS OF PHYSICS				
	COURSE TITLE:	Solar Energy			COURSE CODE: PH3212
DATE:	18 / 6 / 2017	TERM: JUNE	TOTAL ASSESSMENT MARKS: 100	TIME ALLOWED: 2 HOURS	

**Answer the following questions:**

1) a) **Mention only** the optical, thermo physical and weather parameters affecting the efficiency of the solar collector **(10 Marks)**

b) **Write** the Hottel-Whiller equation, **draw** and **discuss** its graphical presentation for single glass and double glass solar collector and **show** the maximum efficiency in each case **(15 Marks)**

2) **Write Briefly on:** (25 Marks)

- Different types of heat exchangers for latent heat thermal energy storage and give an example for each.
- The integration of latent heat thermal energy storage in solar system

3) a- **Write** the definition and **explain** the physical meaning of the dimensionless numbers Nusselt (Nu), Prandtl (Pr), Grashof (Gr) and Fourier (Fo) **(15 Marks)**

b- **Write short notes on :** **(15 Marks)**


- Supercooling of PCM and methods to avoid it
- Different types solar radiation and different devices to measure them

4) a) **Write and explain** the differential energy equation for time dependent and time independent with and without internal source **(10 Marks)**

b- **Show** how radiation and convection losses in solar collector can be minimized **(10 Marks)**

*Best Wishes*

*Examiner : Dr Saad Aboul Enein*

	TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT F PHYSICS				
	EXAMINATION THIRD YEAR FRESH STUDENTS OF PHYSICS				
	COURSE TITLE:	<b>Solar Energy</b>			COURSE CODE: PH3212
DATE:	18 / 6 / 2 017	TERM: JUNE	TOTAL	ASSESSMENT MARKS: 100	TIME ALLOWED: 2 HOURS

**Answer the following questions:**

1) a) **Mention only** the optical ,thermo physical and weather parameters affecting the efficiency of the solar collector **(10 Marks)**

b) **Write** the Hottel-Whiller equation, **draw** and **discuss** its graphical presentation for single glass and double glass solar collector and **show** the maximum efficiency in each case **(15 Marks)**

2) **Write briefly on:** (25Marks)

- Different types of heat exchangers for latent heat thermal energy storage and give an example for each.
- The integration of latent heat thermal energy storage in solar system

3) a- **Write** the definition and **explain** the physical meaning of the dimensionless numbers Nusselt (Nu) , Prandtl (Pr) , Grasshof (Gr) and Fourier (Fo) **(15 Marks)**

b- **Write short notes on :** **(15 Marks)**

- Supercooling of PCM and methods to avoid it
- Different types solar radiation and different devices to measure them


4) a) **Write** and **explain** the differential energy equation for time dependent and time independent with and without internal source **(10 Marks)**

b- **Show** how radiation and convection losses in solar collector can be minimized **(10 Marks)**

**Best Wishes**

**Examiner :Dr Saad Aboul Enein**



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**Solve the Following Questions:**

**First Question :( 25 marks)**

- (a) Discuss explicitly the semiconductor structure and the doping process. Explain the process of formation of the p-n junction, including the types of connection.
- (b) What is the Photovoltaic effect? Explain how the solar cell generates the electricity.

**Second Question :( 25 marks)**

- (a) Define the external parameters of the solar cell, then discuss the optical and recombination losses in these cells.
- (b) Make a comparison between the two high efficient silicon solar cells; Buried- Contact Cell and the heterojunction with intrinsic thin layer (HIT) Cell, including the fabrication, structure, and front and rear contacts.

**Third Question :( 25 marks)**

- (a) Mention the special properties that making the CdTe material is very well suited for use as an active material in thin film solar cells. Discuss three of the different methods of CdTe thin films deposition techniques.
- (b) Compare between Czochralski and Float Zone techniques used for Si single crystal growth.

**Fourth Question :( 25 marks)**

- (a) Define the chalcopyrite structure. Compare between the Co-evaporation and Selenization processes of depositing the Cu(In,Ga)Se<sub>2</sub> solar cells.
- (b) Draw the I-V characteristics curve of the solar cell and define the short circuit current ( $I_{sc}$ ), the open circuit voltage ( $V_{oc}$ ) and the fill factor (FF).

**With my best wishes.**



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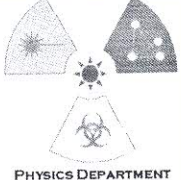
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	TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF PHYSICS		
	FINAL EXAM. FOR MATERIALSCIENCE(LEVELTHREE )		
	COURSE TITLE:	Corrosion and Degradation of Materials	
DATE: 15/6/2017	SEMESTER:TWO	TOTAL ASSESSMENT MARKS: 100	TIME: 2 HOURS

**Answer the following questions:**

**Question [1] :**

**(25 Mark)**

**i- Put (✓)(1Mark) or (X)(2Mark) for the following and then correct the false:**

**(11 Mark)**

- a-The location at which reduction occurs is called the anode.
- b-Corrosion is defined as the destructive and unintentional attack of a metal.
- c-The platinum in the reference cell itself does take part in the electrochemical reaction.
- d-An overall electrochemical reaction must consist of one oxidation and one anode.
- e-In the case,  $K=534$  to give CPR in mm/yr .
- f-Intergranular corrosion occurs preferentially along grain boundaries for some alloys and in specific environments.
- g-Galvanic corrosion occurs when two metals or alloys having different compositions are electrically coupled while exposed to an electrolyte.

**ii-Briefly explain why, for a small anode-to-cathode area ratio, the corrosion rate will be higher than for a large ratio.**

**(7 Marks)**

**iii-Deduce the corrosion rates (r).**

**(7 Marks)**

.....

**Question [2]:**

**(25 Mark)**

**i- Write short notes about the following:**

**(18 Mark)**

The oxidation or rusting of iron in water, - Activation polarization,- and Passivity.

**ii-Discuss scale Types for oxidation in gaseous atmospheres.**

**(7 Marks)**

.....

**Question [3]:**

**(25 Marks)**

**Explain the following:**

Erosion-Corrosion, **(8 Marks)** -- Crevice corrosion, **(8 Marks)** and Corrosion

rates from polarization Data(9 Marks).

**Question [4]:**

(25 Mark)

**Problems:**

1-The corrosion rate is to be determined for some divalent metal M in a solution containing hydrogen ions. The following corrosion data are known about the metal and solution:

For Metal M	For H
$V(M/M^{2+}) = -0.47V$	$V(H^+/H_2) = 0V$
$i_o = 5 \times 10^{-10} A/cm^2$	$i_o = 2 \times 10^{-9} A/cm^2$
$\beta = +0.15$	$\beta = -0.12$

a. Assuming that activation polarization controls both oxidation and reduction reactions, determine the rate of corrosion of metal M (in  $mol/cm^2 \cdot s$ ).

b. Compute the corrosion potential for this reaction.

(13 Mark)

2-In the following table , weight gain-time data for the oxidation of some metal at an elevated temperature are given.

a. Determine whether the oxidation kinetics obey a linear, parabolic, or logarithmic rate expression.

b. Now compute W after a time of 1000 min

$W (mg/cm^2)$	Time (min)
4.8	20
9.6	40
19.2	80

(12 Mark)

Examiner.

Dr. Samy El-Attar.

Good luck

*5/2/17*

Tanta University- Faculty of science

Physics Department-Final Exam – June-2017.

BP 3257 – 3<sup>rd</sup> year- Time: 2 hour.

I-Choose the correct answer:

( 30 marks )

1- If the specific gamma ray constant is  $0.5 \text{ Rm}^2/\text{Ci.h}$  then the exposure rate at a distance 1.7m from source of activity 200 mCi is :

$X = \dots\dots\dots \text{mR/h}$

2- The free air chamber is .....instrument for measuring routine exposure.

a- a practical

b- more portable

c- not a practical

d- none of above

3- If the value of exposure is  $3.876 \times 10^{-5} \text{ C/kg}$  which corresponds to

a- 149m R

b- 1.49m R

c-149 R

d-14.9 R

4-The threshold radiation dose effect for Thyroid is;

a-100 rad

b-100 Sv

c-100 rem

d-100 Gy

5-An exposure of one roentgen gives a dose in air equal to :

a- 0. 876 Gy

b-  $8.76 \times 10^{-2} \text{ Gy}$

c- 0.876 rad

d-  $8.76 \times 10^{-3} \text{ rad}$



**6-When radiation is passes through water the formed free radicals are**

**a- $\text{H}^2\text{O}^+$  and  $\text{e}^-$**

**b-  $\text{H}^-$  and  $\text{OH}^-$**

**c-H and OH**

**d- $\text{H}^+$  and  $\text{OH}^+$**

**7- Kerma is a measure of all energy transferred from**

**a-uncharged particles**

**b-charged particles**

**c-infrared radiation**

**d-microwaves radiation**

**8- All the biological damage effects begin with the consequence of radiation**

**Interaction with**

**a- organs**

**b-cells**

**c- molecules forming cells**

**d- atoms forming cells**

**9-If the radiation damage processes include cell death, change in genetic data in cells, mutation, cancer this point to**

**a- physico/ chemical stage**

**b- physical stage**

**c- physiological stage**

**d- chemical stage**

**10- Units of radiation exposure measure:**

**a-Ionization air**

**b-occupational exposure**

**c- energy deposited in tissue**

**d- radioactivity**

**II- Complete the following sentences :**

**(40 marks )**

**1- If the radiation interacts with atoms of DNA molecules or critical target molecules , it is referred to as a.....effect.**

**2-The amount of energy transferred from x-ray or gamma ray to a unit of**

mass of air is called.....

3- In air wall chamber the value of thickness which is equal to the range of the most energetic secondary electron produced in the wall is called.....

4- Value of.....rad to the thyroid gland can result in benign tumors.

5- Whole body dose greater than 20 Gy damage to cell such as.....cells.

6- Lymphoid, bone marrow, and gonads are.....tissue radio-sensitivity.

7- The rate of energy transfer per unit length is the definition of.....

8- The average energy needed for photon to make an ion pairs in air is equal to.....eV/ip.

9- The.....is the sum of the initial kinetic energies of all charged particles liberated by uncharged ionizing radiation.

10- Total body dose in excess of .....Gy leads to gastrointestinal syndrome.

III- Put (✓) or (×) for the following then correct the wrong one: (30 marks)

1- Acute dose of 600 rad to ovaries or testicles can result in permanent sterilization. (.....)

2- The threshold for immune system is 0.45 Gy. (.....)

3- Total body irradiation dose 10 – 12 Gy cerebrovascular syndrome. (.....)

4- The duration of the chemical damage process is few ms to few sec. (.....)

5- An acute dose 200 – 300 rad result in erythema. (.....)



6- There is a consequence from the two ions  $H^+$  and  $OH^-$  for biological effect of radiation. (.....)

7- The  $H_2O_2$  is a very powerful oxidizing agent which can affect cells. (.....)

8- Threshold dose of 15 – 30 rad reduced sperm count. (.....)

9- Hematopoietic syndrome result in production of RBC, WBC and platelets is Suppressed, for whole body dose 0.25 -1 Gy. (.....)

10- rem is considered from standard international units (SI units). (.....)

	TANTA UNIVERSITY FACULTY OF SCIENCE PHYSICS DEPARTMENT				
	FINAL EXAMINATION FOR (THIRD LEVEL) STUDENTS OF SPECIAL MATERIAL SCIENCE				
	COURSE TITLE: RADIATION DOSIMETRY		COURSE CODE: PH3121		
DATE:24	JON., 2017	FINAL EXAME	TSSSESSMEOTAL ANT MARKS: 100	TIME ALLOWED:2 HOURS	

**First question (30 marks) What we mean by ?.**

- 1- Nucleus classification according to its constructor.
- 2- Radioactivity.
- 3- Dosimetry.
- 4- Isoelectronic Species , Isosters and Isomeric transition.
- 5- Biological Half-life and Biological effects .
- 6- Non-ionizing radiation.
- 7- The effects of Electromagnetic Radiation on health (EMR)
- 8- The penetration of radiation.
- 9- Radiation detectors
- 10- Radiation units

**Second question (20 marks) write not more 40 words on one of the following:**

- 1- Elastic scattering of photons with matter.
- 2- biological effects of radiation
- 3- ALARA
- 4- Radiation detector requirements

**Third question (20 marks) write the mathematical relation and units of each of following expressions:**

- 1- Activity
- 2- Equivalent dose
- 3- Energy of Gamma- rays
- 4- Radiation range.
- 5- Total mass stopping power

**EXAMINARS: Prof. Khaled M. Omar + Dr. Mohamed magdy**



**Forth question (30 marks) rewrite the sentences and complete it using the following code table by writing the code only.**

- 1- In case of beta decay ... )
- 2- Which of the following is not a type of electromagnetic radiation?
- 3- The orbital electron shell that is closest to the nucleus is:
- 4- The ....describes the thickness of the medium needed to attenuate the beam's original intensity in half.
- 5- Which of the following is not a filter used for low-energy treatment machines?
- 6- The true regarding direct effects of radiation is
- 7- Pair production process occurs in \_\_\_\_\_.
- 8- The organization sets the recommended dose limit for radiation workers and the general public is-.
- 9- The \_\_\_\_ tail is seen at the end of electron depth dose curves(
- 10- Electromagnetic radiation is ----- by alternating electric and magnetic fields, which are perpendicular to one another and the direction of their energy transmission. The EM spectrum includes X-rays , -----, UV lights ,Visible light, microwaves and ----.
- 11- Electromagnetic radiation will interact with tissue by three ways ---

**Table of codes**

code	Sentences
01042	A positron and negatron are
01182	Photon beams $\geq 1.022$ MeV
01082	Neutrons.
02042	NCRP
01012	k-shell
01212	Bremsstrahlung
01112	The half – value layer
04031	Identified by alternating
01133	Tungston
05011	Radio waves.
05031	Cosmic
05012	Absorbed by the medium
06011	Scattered by the medium
05111	Travel through the medium with no interaction.

**EXAMINARS: Prof. Khaled M. Omar + Dr. Mohamed magdy**