	TANTA UNIVERSITY- FACULTY OF SCIENCE –DEPARTMENT OF PHYSICS			
	EXAMINATION FOR THIRD LEVEL STUDENTS OF MATERIAL SCIENCE			
	COURSE TITLE:	SOLID STATE PHYSICS 1		COURSE CODE :*PH3161*
DATE:	24,DECEMBER, 2017	TERM :FIRST	TOTAL ASSESSMENT MARKS: 100	TIME ALLOWED :2 HOURS

ANSWER THE FOLLOWING QUESTIONS:

First Question

a) Name the seven types of crystal systems and give the relation of lengths of axes and the relation of angles between the axes of each type. (13 marks)

b) Describe briefly the powder photograph. (12 marks)

Second Question

a) In a cubic unit cell draw the planes (111), (202), (432) and (100). Calculate the inter planer distances for these planers if a=3.5$\mathring{A}$. (13 marks)

b) Discuss in details the inter atomic forces in crystals. (12 marks)

Third Question

a) Derive an expression for the determination of unit cell dimensions of a rectangular unit cell. (13 marks)

b) Prove that the Fermi energy E_o in an intrinsic semiconductor lies half way between the top of the valence band and the bottom of the conduction band. (12 marks)

Fourth Question

Discuss in details the free electron model in a metal and derive an expression for the energy level in three dimensions. (25 marks)

TANTA UNIVERSITY
FACULTY OF SCIENCE
DEPARTMENT OF PHYSICS

COURSE TITELE: Quantum Mechanics 1 COURSE CODE PH 3131
DATE: 2017 TERM:FIRST TOTAL ASSESSMENT MARKS: 100 TIME ALLOWED:2 HOURS

Answer the following Questions:

1 – For a harmonic oscillator in the superposition state

$$\Psi(x,t) = \frac{1}{\sqrt{2}}\left[\Psi_0(x,t) + \Psi_1(x,t)\right]$$

Calculate the expectation value of momentum . (20 marks)

2- A particle of mass m moves in a three dimensional box, its lengths are a, b and C. The Potential energy inside the box is zero while outside is infinity. Derive the eigen wave functions and the eigen values of energy. (25 marks)

3 – a- What is the expectation value of Parity for a particle in a one dimensional box with walls at $(-\frac{L}{2}, \frac{L}{2})$ in the initial state

$$\Psi(x,0) = \frac{1}{\sqrt{29}}\left[3\tilde{\varphi}_2 + 4\tilde{\varphi}_4 + 2\varphi_3\right]$$

Where $\tilde{\varphi}_n = \sqrt{\frac{2}{L}}\sin\left(\frac{n\pi x}{L}\right)$, $n = 2, 4, \ldots$

$\varphi_n = \sqrt{\frac{2}{L}}\cos\left(\frac{n\pi x}{L}\right)$, $n = 1, 3, \ldots$

(10 marks)

b – Derive a law covers the time development of the expectation value. (10 marks)

c – What is the ad joint operator of the operator $\frac{d}{dx}$? (10marks)

4 - Calculate the transmission coefficient for the case of incident particles incident on a potential rectangular barrier V_0 . The energy of the particles less than V_0 . (25 marks)

Examiner : Prof . Dr. Nabil El-siragy

	TANTA UNIVERSITY- FACULTY OF SCIENCE –DEPARTMENT OF PHYSICS			
	EXAMINATION FOR THIRD LEVEL STUDENTS OF MATERIAL SCIENCE			
	COURSE TITLE:	SOLID STATE PHYSICS 1		COURSE CODE :*PH3161*
DATE:	24,DECEMBER, 2017	TERM :FIRST	TOTAL ASSESSMENT MARKS: 100	TIME ALLOWED :2 HOURS

ANSWER THE FOLLOWING QUESTIONS:

First Question

a) Name the seven types of crystal systems and give the relation of lengths of axes and the relation of angles between the axes of each type. (13 marks)

b) Describe briefly the powder photograph. (12 marks)

Second Question

a) In a cubic unit cell draw the planes (111), (202), (432) and (100). Calculate the inter planer distances for these planers if a=3.5Å . (13 marks)

b) Discuss in details the inter atomic forces in crystals. (12 marks)

Third Question

a) Derive an expression for the determination of unit cell dimensions of a rectangular unit cell. (13 marks)

b) Prove that the Fermi energy E_o in an intrinsic semiconductor lies half way between the top of the valence band and the bottom of the conduction band. (12 marks)

Fourth Question

Discuss in details the free electron model in a metal and derive an expression for the energy level in three dimensions. (25 marks)

	TANTA UNIVERSITY- FACULTY OF SCIENCE –DEPARTMENT OF PHYSICS			
	EXAMINATION FOR THIRD LEVEL STUDENTS OF MATERIAL SCIENCE			
	COURSE TITLE:	SOLID STATE PHYSICS 1		COURSE CODE :*PH3161*
DATE:	24,DECEMBER, 2017	TERM :FIRST	TOTAL ASSESSMENT MARKS: 100	TIME ALLOWED :2 HOURS

ANSWER THE FOLLOWING QUESTIONS:

First Question

a) Name the seven types of crystal systems and give the relation of lengths of axes and the relation of angles between the axes of each type. (13 marks)

b) Describe briefly the powder photograph. (12 marks)

Second Question

a) In a cubic unit cell draw the planes (111), (202), (432) and (100). Calculate the inter planer distances for these planers if a=3.5$\mathring{A}$. (13 marks)

b) Discuss in details the inter atomic forces in crystals. (12 marks)

Third Question

a) Derive an expression for the determination of unit cell dimensions of a rectangular unit cell. (13 marks)

b) Prove that the Fermi energy E_F in an intrinsic semiconductor lies half way between the top of the valence band and the bottom of the conduction band. (12 marks)

Fourth Question

Discuss in details the free electron model in a metal and derive an expression for the energy level in three dimensions. (25 marks)

	TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF PHYSICS			
	THIRD YEAR (PHYSICS+BIOPHYSICS)			
	COURSE TITLE:	Electrodynamic 1		COURSE CODE:3171
DATE:	31-12- 2017	TERM: FIRST	TOTAL ASSESSMENT MARKS:100	TIME ALLOWED: 2 HOUR

Please Answer the Following:

Question (1): (a) Put true or false and comment on your answer:
1- A perfect conductor can have electrostatic charges inside it.
2- The dielectric material is always dielectric whatever the applied external electric field.
3- Isotropic conductor has a conductivity which varies with direction.
4- The dielectric tensor is used to describe anisotropic dielectrics.
5- The application of external electric field to the dielectric material causes the flux density to be greater that it would be in free space. **(10 Marks)**

(b) A dielectric cube of side L and center at the origin has a radial polarization given by $P = 100\, r$, where $r = 3\, x^2\, a_x + 10\, y\, a_y + 2\, z\, a_z$. Find all bound charge densities and show explicitly that the total bound charge vanishes. (15 Marks)

Question (2): (a)- Calculate the Jacobian matrix $\frac{dx\, dy\, dz}{d\rho\, \rho d\varphi\, dz}$ to transform from cylindrical coordinate to Cartesian coordinate. Prove that the determinant of the matrix equals 1. **(10 Marks)**

(b)- Given the vector field

$$D = r\, sin\, \varphi\, a_r - \frac{1}{r} sin\, \vartheta\, cos\, \varphi\, a_\vartheta + r^2 a_\varphi$$

Determine (I) D at P(10, 50 degree, 30 degree). (II) The component of D tangential to the spherical surface r=5 at P. **(15 Marks)**

Question (3): (a) Discuss the uniqueness theorem of Laplace's and Poisson's equations. **(10 Marks)**

(b) Semi-infinite conducting planes at $\varphi = 0$ and $\varphi = \pi/3$ are separated by an infitesimal insulating gap. If the $V(\varphi = 0) = 0$ and $V(\varphi = \pi/3) = 150$ V, calculate the potential and the electric field in the region between the planes.

(Hint: $\frac{1}{\rho}\frac{\partial}{\partial \rho}\, \rho\, \frac{\partial V}{\partial \rho} + \frac{1}{\rho^2}\frac{\partial}{\partial \varphi}\frac{\partial}{\partial \varphi}\, V + \frac{\partial}{\partial z}\frac{\partial}{\partial z} V = 0$ **)** **(15 Marks)**

Question (4) (a) Discuss the general solution of Laplace's equation in 2D. **(10 Marks)**

(b) Two extensive homogeneous isotropic dielectrics meet on plane $z = 0$. For $z > 0$, $\varepsilon_{r1} = 4$ and for $z < 0$, $\varepsilon_{r2} = 3$. A uniform electric field $E_1 = 5\, a_x + 2a_y + 3\, a_z$ kV/m exists for $z \geq 0$. Find the electric field E_2 and electric flux D_2 for $z \leq 0$. **(15 Marks)**

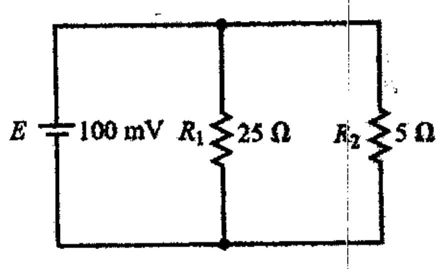
☺ ☺ **Best Wishes** ☺ ☺ ..... **Dr. Mohammed Shihab**

TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF PHYSICS			
EXAMINATION FOR **THIRD YEAR** STUDENTS OF PHYSICS AND BIOPHYSICS (SEMESTER 1)			
COURSE TITLE:	ELECTRICAL CIRCUITS دوائر كهربية		COURSE CODE: PH3151
DATE: 02 JANUARY, 2018	TERM: FIRST	TOTAL ASSESSMENT MARKS:100	FINAL EXAM

Please Note that the questions are in two separate pages

Answer The Following:

First question (25 points):



1-(10 points) Verify the conservation of energy principle in the following circuit.

2-(10 points) Correct the following sentences:

1-Kirchhoff's current law states that the summation of voltage rises and drops around a closed loop equals zero.

2-Linear networks are any networks that operate in the same manner regardless the direction of the current in the network.

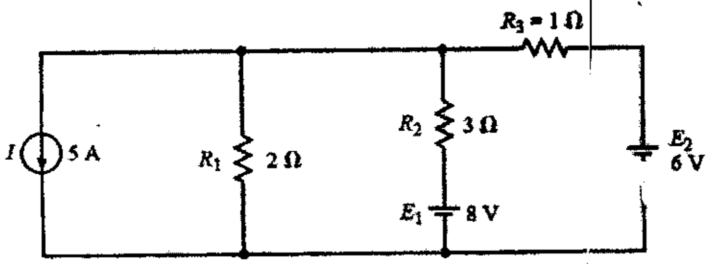
3-When applying the superposition theory to power, the summation of the power dissipated in a resistance is the summation of the power dissipated in this resistance due to each separate source.

4-The first step, when applying Nodal analysis technique, is to convert each current source into equivalent voltage source.

5- The time it takes transient voltages and currents to reach 99.3% of its final value is the time constant.

3-(5 points) Using Kirchhoff's Law Find the equivalent capacitance to three capacitors connected in parallel and repeat the derivation when they are connected in series.

Second question (25 points):



1-(10 points) Using Branch Current analysis technique find the current in each branch.

2-(10 points) Define the following

1- Norton theorem
2- Chassis ground
3- Duty Cycle
4- Stray capacitance
5- Phase difference

3-(5 points) Using timing diagram show the difference between rise time-pulse width and fall time.

Third Question (25 points):

1-(10 points) Using timing diagrams show the effect of the pulse width on the pulse response of the RC circuits.

Please Turn Over the page for the rest of the questions.

	TANTAUNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF PHYSICS			
	EXAMINATION OF (THIRD YEAR) STUDENTS OF PHYSICS& BIOPHYSICS (CREDIT HOURS)			
	COURSE TITLE:	Atomics pectroscopy		COURSE CODE: PH3141
DATE:	4\1\2018	TERM: FIRST	TOTAL ASSESSMENT MARKS:100	TIME ALLOWED: 2HOURS

Question(1):-

a. Show that the spin orbit interaction energy is given by the following

$$\Delta E = \frac{1}{2m^2c^2}\frac{1}{r}\frac{dV(r)}{dr}SL$$

expression (15Marks)

b. Find out the longest wavelength of Lyman series transitions of hydrogen atom, then find the end of the series.($m=9.035\times10^{-28}$g, $e=4.77\times10^{-10}$e.s.u. $h= 6.0547\times10^{-27}$erg sec)
(5 Marks)

c. If you have n=9, show according the sommerfeld's elliptic orbits the shapeof these orbits. (5 Marks)

Question(2):-

a. Derive that the group velocity of the De Broglie waves is the same as that of the particle. (10 Marks)

b. Discuss in details about:-(15Marks)
Rutherford scattering experiment- Wien's displacement Law
Characteristics of the Bohr circular orbits

Question(3):-

a. Show that the energy depends only upon the semi – major axis a, not upon eccentricity. (20 Marks)

b. The wavelength of the photoelectric threshold of Tungsten is 230 nm. Determine the energy of the electrons ejected from the surface by ultraviolet light of wavelength 180 nm.(5Marks)

Question(4):-

a. Derive the equation that relates the scattering angle and the the impact parameter. (15 Marks)

b. State the three Bohr's Assumptions and Write the equation of each one with meaning of each symbol .(10 Marks)

Dr. Shrouk Fathy Elashry

☺ أطيب التمنيات بالتوفيق ☺

7	Ln (N!) = N*Ln(N) – N
8	The Maxwell-Boltzmann Distribution has formula n = g exp(α – β ε)
9	The Bose-Einstein Distribution (BED) has form n = 1/(exp(-α + βε) -1)
10	the microstate is a full mechanical description
11	The same properties and distribution close to the MBD.
12	To the everyday macroscopic world that we are familiar with.
13	Lightly changed or constant
14	thermodynamic systems and themal equilibrium
15	Good examenation or bad one
16	Thermodynamics is concerned about heat and the direction of heat flow, whereas statistical physics gives a microscopic perspective of heat in terms of the structure of matter and provides a way of evaluating the thermal the thermal properties of matter e.g. heat capacity.
17	Equal non-localized.
18	statistical notation of a distribution of particles giving more detail.
19	Small and identical particles cannot be distinguished during collisions.
20	Total wave function ψ is zero
21	Fermion. Fermion is matter particle resting on the Pauli's exclusion principle.
22	deals with thermal equilibrium and helps define the concept of temperature.
24	between the over-elaborate detail of mechanics and the obscure generalities of the phonominoligical quantity.
26	sates that the system's internal energy changes in accord with the law of conservation of energy
28	natural thermodynamic process, the sum of the entropies of the interacting thermodynamic systems increases
30	The entropy of a system approaches a constant value as the temperature approaches absolute zero.

EXAMINARS: Prof. N. Z. Darwesh + Prof. Khaled M. Omar

P.T.O

من فضلك انظر خلفه

(3)

TANTA UNIVERSITY	TANTA UNIVERSITY FACULTY OF SCIENCE PHYSICS DEPATMENT			FACULTY OF SCIENCE
	FINAL TERM EXAMINATION FOR (THIRD LEVEL) STUDENTS OF SPECIAL PHYSICS			
	COURSE TITLE: STATISTICAL PHYSICS1		COURSE CODE: PH3121	
DATE:13	JAN., 2018	FINAL EXAME	TOTAL ASSESSMENT MARKS: 100	TIME ALLOWED: 2 HOURS

FOURTH QUISTION: (30 marks):

Rewrite the followings and Complete using codes of the data table:

1	The aim of statistical physics is……..
2	Zeroth law of thermodynamics……
3	Symmetric wave functions with integral spin called…….. ….
4	Anti-symmetric wavefunction with half-integral spin calls…..
5	Three ways of specifying the thermodynamic system are: 1-…….. .2-…. 3-……
6	For an isolated system its energy E, total number of particles N and its volume V must be …..or….
7	Third law of thermodynamics …… ……
8	All macrostates of significant probability have ……..
9	Stirling's approximation for large number N take the form …….
10	The four laws of thermodynamics define…….
11	First law of thermodynamics:…
12	When 2 fermions are in the same state…… ……
13	The 4th laws of thermodynamics characterize……..
14	Second law of thermodynamics is …

Data table

No.	Data sentences
1	The macrostate corresponds to the system,
2	The Fermi-Dirac Distribution (FDD) has form n = 1/(exp(-α + βε)+1)
3	Bosons. Particles containing even numbers of fermions obey BED
4	.the logarithm of the number of ways the system can be configured to yield the same value of probable.
5	Two fermions are in the same state total wave function is zero according to Paull's Exclusion principle.
6	Some fundamental physical quantities: temperature, energy, and entropy.

٣ تحليلي :٥

	TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF PHYSICS			
	EXAMINATION FOR FRESHMEN (THIRD YEAR) STUDENTS OF PHYSICS &M.SCIENCE			
	COURSE TITLE:	COMPUTIONAL PHYSICS فيزياء حاسوبية		COURSE CODE:PH3181
TERM	17/1/2018	TERM: FIRST	TOTAL ASSESSMENT MARKS: 100	TIME ALLOWED: 2 HOURS

Answer The Following Questions:

First Question: (25 mark)

a) Construct a flowchart to read two numbers X and Y and print out which number is larger.

b) Draw a flowchart to determine if a point (x, y) lies within a circle of radius, r, centered at the origin. Use the condition that if $(x^2 + y^2)^{1/2} < r$,then the point is within the circle. If the point lies within the circle, print out a message and the distance, z, of that point from the center of the circle.

Second Question: (25 mark)

a) Write short notes about unconditional and conditional transfer statements in Fortran language and state an example for each statement.

b) By using mathematical If statement and formatted input and output write a FORTRAN program to compute the values of the variable ,a , which is given by:

$$\begin{cases} a = 5\,b + 2\,c & \text{if} \quad L < 0 \\ a = (\sin(c) / \tan(b)) & \text{if} \quad L = 0 \\ a = 3\,b^2 + 7 & \text{if} \quad L > 0 \end{cases}$$

Third Question: (25 mark)

a) State the general form of the counted DO loop and write down its rules.

b) Write a program to compute the value of, a, given by the following series:

$$a = \frac{1}{2} + \frac{3}{4} + \frac{5}{6} + \cdots \cdots\cdots\cdots \frac{87}{88}$$

c) Write a program to print out the odd numbers from 1 to 100.

Fourth question: (25 mark)

a) By using MATHEMATICAL GO TO and formatted input and output write a Fortran program to read the value of the nshape and calculate the following:

i) - The area and perimeter of a rectangle if nshape = 1

ii) - The area and perimeter of a square. if nshape = 2

iii) - $x = y^2 + z^2$ if nshape = 3

iv) - $a = b|\cos(c)|$ if nshape = 4

b) Using nested DO loop write a program to print out the values of the variable X, which is given by the formula $X = b^3 + 6c^4 + 5d^2$ for the values of, b, c and d between -5 and 5 in increment of 0.1

EXAMINERS	PROF.DR. G.A.GABALLA	

(c)

	TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF PHYSICS		
	EXAMINATION FOR STUDENTS OF MS(THIRD LEVEL).		
COURSE TITLE:	**crystallography**		COURSE CODE:3141
DATE: 18 :1: 2018	TERM: FIRST	TOTAL ASSESSMENT MARKS: 100	TIME ALLOWED: 2 HOUR

80

N =6.02x10^{23} mol^{-1} , h=6.62x10 $^{-34}$ J.s , K =1.38x10 $^{-23}$ J.K

Answer The Following Questions

First Question:

Sign√ for true and x for false sentences (10 marks)

1- No matter what type of packing, the coordination number of Hexagonal close packing (hcp) and Cubic close packing (ccp) is always 12.

2- Constructive interference only occurs when the scattering vector, **K**, coincides with a reciprocal lattice vector, **G**

3- At equilibrium distances r_0 the repulsion and attraction forces are equal.

4 - The unit vector a*in reciprocal lattice is perpendicular to the unit vector(a) in real lattice.

5- The primitive cubic unit cell contains one lattice point , bcc two points and Fcc three points.

6 - Laue condition means thatthe instructive interference for the diffracted x-ray occurs when the scattering vector K equals reciprocal lattice vector G.

7 -All unit cells have the same area and similar shape

8- The cubic unit cell has 8 plane symmetry

9- Zn is considered as a filter for CuK_B

10 - X-ray diffraction can distinguish between Fe(Z=26) , Co (Z = 27).

Second question

Choose the correct answers for the following sentences (20marks)

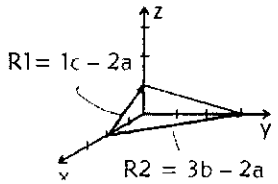
1 - The ratio $\frac{G_{200}}{G_{111}}$ for (Fcc)Pb crystal where r_{Pb} =1.743 A^{0}and (G is a reciprocal lattice vector)

a - 2.63 b -1.16 c - 2.0 d - 1.01

2- Tetragonal crystal has a = 4.5Å, c = 6Å , thus(d) for plane (222) equals

a-1.4 Å b- 2.4 Å c- 0.7 Å d- 0.41 Å

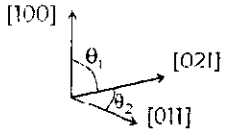
3- The miller indices for the given plane in figure is



a-(236) b-(336) c-(623) d-(326)

4 - The angle Θ_1 in figure equals

a- 30^0 b- 45^0 c- 90^0 d- 75^0



5-The free volume at Fcc lattice occupied by atoms with radius r and the lattice constant (a) is

a- 0.32a^3 b - 0.52a^3 c - 0. 26a^3 d - 0.72a^3

6-The number of atoms per cm^2 in 100 plane for Pb crystal which is Fcc with lattice constant a = 4.93A^0

a- 8.23x10^{14} b - 2.99x10^{14} c - 4.99x10^{14} d - 5.81x10^{14}