University of Tanta
Faculty of Science
Department of Physics

ميزياء + ميزياء صيوى

Quantum Mechanics 1

Course code : PH3131

Date : 28/12/2016

Time allowed : 2 Horurs

Answer the following questions :

(1) a - Consider the operator $\hat{A}$,

$$\hat{A}\varphi(x) = \varphi^*(x)$$

i – is $\hat{A}$ Hermit ian ? (5 marks)

ii – What are the eigenfunctions of $\hat{A}$? (5 marks)

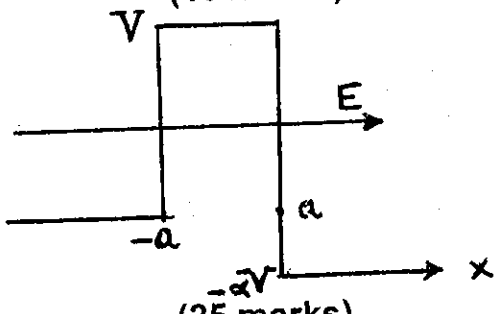
iii – What are the eigenvalues of $\hat{A}$? (5 marks)

b – Prove that for the free- particle Hamiltonian $\hat{H}$ is Hermitian . (10 marks)

(2) a – Calculate the expectation value of the potential energy for a harmonic oscillator. (15 marks)

b – Derive the grounded state wave function of the harmonic oscillator (10 marks)

(3) Calculate the transmission coefficient for the shown configuration if the energy of the incident beam is smaller than the potential energy V . α is Constant.



(25 marks)

(4) Consider a one-dimensional box centered at the origin, its walls at $X = \frac{1}{2}L$, $X = -\frac{1}{2}L$. At t = O the particle in the state :

$$\psi(x,0) = \sqrt{\frac{2}{21L}}\left[\cos\frac{\pi x}{L} + 2\sin\frac{2\pi x}{L} + 4\cos\frac{3\pi x}{L}\right]$$

a - What is $\psi(x,t)$? (6 marks)

b - What is the probability $P(E_n)$? (6 marks)

c – Calculate $\langle E \rangle_{t=o}$. (6 marks)

d – Calculate the expectation value of parity (7 marks)

فيزياء كهربية ٦

	TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF PHYSICS			
	EXAMINATION FOR **JUNIORS** (THIRD LEVEL) STUDENTS OF PHYSICS (SEMESTER 1)			
	COURSE TITLE:	ELECTRICAL CIRCUITS دوائر كهربية لطلاب المستوى الثالث (شعبة الفيزياء والفيزياء الحيويه)		COURSE CODE: PH3151
DATE:2	JANUARY, 2016	TERM: FIRST	TOTAL ASSESSMENT MARKS: 100	TIME ALLOWED: 2 HOURS

Answer The Following:

First question: **{24 Marks}**

a) Define the following: (12Marks)
   1) Kirchhoff's current law.
   2) Kirchhoff's voltage law.
   3) Norton's Theorem.

b) Determine the magnitude and the correct direction of the unknown currents in the network of figure 1.

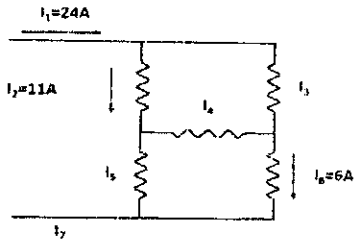


Fig. 1 (12 Marks)

Second question: **{28 Marks}**

a) For the network shown in figure 2 find:
   1) The total Resistance R_T.
   2) Calculate the voltage V_{ab}.

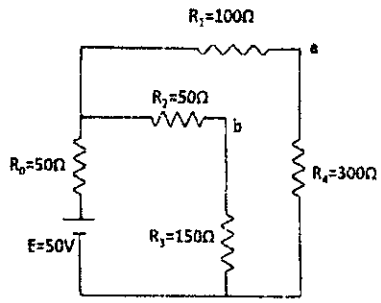


Fig. 2 (14Marks)

b) Find the current in each branch of the network in figure 3 using branch-current analysis.

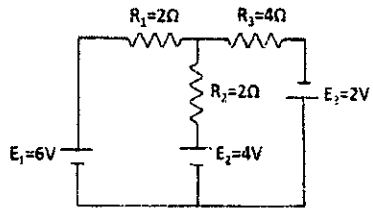


Fig. 3 (14 Marks)

Please turn over

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FOURTH QUISTION: (20 marks):

Complete the followings using the data table:

.a	What is the statistical physics? The ……
.b	When 2 fermions are in the same state…… ……
.c	Distinguishability: ……
.e	The statistical entropy is ……
.f	Anti-symmetric wavefunction with half-integral spin calls…..
.g	For an isolated system its energy E, total number of particles N and its volume V must be ……or….
.h	Stirling's approximation for large number N take the form …….
.i	All macrostates of significant probability have ……..
.j	Symmetric wave functions with integral spin called……
.k	The purpose of this course is to introduce the dictionary that allows you translate from the microscopic world where the laws of Nature are written……

Data table

No.	Data sentences
1	Bosons. Particles containing even numbers of fermions obey BED
2	Two fermions are in the same state total wave function is zero according to Paull's Exclusion principle.
3	Ln (N!) = N*Ln(N) – N
4	The Bose-Einstein Distribution (BED) has form $n = 1/(\exp(-\alpha + \beta\varepsilon) -1)$
5	The same properties and distribution close to the MBD.
6	Lightly changed or constant
7	Fixed
8	Equal non-localized.
9	Small and identical particles cannotbedistinguished during collisions.
10	Fermion. Fermion is matter particle resting on the Pauli's exclusion principle.
11	The Fermi-Dirac Distribution (FDD) has form $n = 1/(\exp(-\alpha + \beta\varepsilon)+1)$
12	.the logarithm of the number of ways the system can be configured to yield the same value of probable.
13	The Maxwell-Boltzmann Distribution has formula $n= g \exp(\alpha - \beta \varepsilon)$
14	To the everyday macroscopic world that we are familiar with.
15	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.
16	Total wave function Ψ is zero

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

فيزياء ٦ علوم مودرن ٢

TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF PHYSICS			
General Physics & Material Science: (LEVELTHREE)			
COURSE TITLE:	Environmental Physics		COURSE CODE: PH3191
TOTAL MARKS 100	SEMESTER: ONE	TIME ALLOWED: TWO HOURS	DATE: 14/1/2017

Q1: Put (√) or (X) and then correct the wrong sentences **(18 Marks)**

a- parabolic trough is less efficient than power tower in generating electricity ( )

b- Magnetosphere is the coldest region in atmosphere ( )

c- Global solar radiation is the sum of diffused and direct solar radiation ( )

d- Neutrons and electrons are examples for indirect ionizing radiation ( )

e- The upper part of the Ionosphere contains ozone layer ( )

f- Photoelectric effect is dominant at high electron energies ( )

Q2: Define the following terms:

Hot particles – Equivalent dose – Particle fluence – KERMA – CEMA- Collision stopping power – Radiative stopping power – Scintillation materials **(24 Marks)**

Q3: Complete the following sentences: **(31 Marks)**

1- Different types of high temperature solar collectors are
a-..... b-..... c-.....

2- The properties of a good dosimeter are:
a- ..... b-..... c-..... d-..... e-.....

3- The formation and release of hot particles in environment is due to:
a-..... b-..... c-..... d-.....

4- The different layers of the atmosphere are:
a- ..... b-..... c-..... d-..... e-.....
f-..... g-.....

5- The unit of effective dose is ....., the unit of exposure is .....,

6- For small cavity size, we can apply ..... and ..... theories.
While for intermediate cavity size, we can apply..... theory

7- The three different types for β-decay are:
a-..... b-..... c-.....

8- The different main methods for radioactive decay are:
a-..... b-..... c-..... d-.....

Q4: Answer the following questions briefly. **(27 Marks)**

A- Compare between Bragg-Gray and Spencer-Attix cavity theories?

B- Discuss green-house effect.

C- Compare between BWR and LMBFR according to 1-function 2-basic principle of operation 3-construction (core, coolant, moderator, heat transfer medium)

Examiners *Prof. Dr. Ibrahim Bondouk*
Dr. Sherief Hamada.

☺ أطيب التمنيات لكم بالنجاح و بالتوفيق ☺

	TANTA UNIVERSITY- FACULTY OF SCIENCE –DEPARTMENT OF PHYSICS			
	EXAMINATION FOR THIRD LEVEL STUDENTS OF PHYSICS			
	COURSE TITLE:	SOLID STATE PHYSICS 1		COURSE CODE :*PH3161*
DATE:	26,JANUARY, 2017	TERM :FIRST	TOTAL ASSESSMENT MARKS: 100	TIME ALLOWED :2 HOURS

ANSWER THE FOLLOWING QUESTIONS:

1) Write short notes on:
   a) Crystal systems and fourteen Bravais lattices. (13 marks)
   b) Diffraction of X-rays and deduce Bragg's law. (12 marks)

2) a) In a cubic unit cell draw the planes (111), (202), (132) and (100). Calculate the inter planer distances for these planers if a=4.8A°. (12 marks)
   b) Explain in details one type of x-ray photographs. (13 marks)

3) Discuss the inter atomic forces in solids and show that the formation of chemical bond requires that the repulsive forces be of shorter range than the attractive ones and write short notes on valence crystal. (25 marks)

4) Prove that:
   a) The inter planer distance d of a given plane (hkl) for a rectangular unit cell is given by the equation:

$$d = \frac{1}{\sqrt{\frac{h^2}{a^2}+\frac{k^2}{b^2}+\frac{l^2}{c^2}}}$$ (12 marks)

   b) The Fermi energy E_s in an intrinsic semiconductor lies half way between the top of the valence band and the bottom of the conduction band. (13 marks)

EXAMINERS	PROF .DR . ABD ELRAZIK ABDEEN

BEST WISHES

فيزياء ٢

	TANTA UNIVERSITY- FACULTY OF SCIENCE –DEPARTMENT OF PHYSICS			
	EXAMINATION FOR THIRD LEVEL STUDENTS OF PHYSICS			
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   b) 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. (13 marks)

EXAMINERS	PROF .DR . ABD ELRAZIK ABDEEN

BEST WISHES

	TANTA UNIVERSITY FACULTY OF SCIENCE PHYSICS DEPATMENT			
	FINAL TERM EXAMINATION FOR (THIRD LEVEL) STUDENTS OF SPECIAL PHYSICS			
	COURSE TITLE: STATISTICAL PHYSICS 1		COURSE CODE: PH3121	
DATE:9 JAN., 2017		FINAL EXAME	TOTAL ASSESSMENT MARKS: 100	TIME ALLOWED:2 HOURS

FRIST Question:(35 marks)

What is meant by ؟

a) Moment when the universe has reached a state of maximum entropy.
b) Drive Maxwell-Boltzmann Distribution from the perspective of equilibrium.
c) The non-limitation of occupation number at each level of quantum state.
d) Helmholtz free energy & the relation between Helmholtz and entropy, pressure .
e) Equipartition Theorem "All terms in the Hamiltonian with squared coordinates will contribute = 1/2 KT to the average energy."
f) The classical statistical of Maxwell- Boltzmann conditions.
g) The difference between FDD & BED (two types of statistical distribution)

SCOND QUISTION:(30 marks)

Determine:

a) The partition function for states (Zsp), the relative probability of preoccupation each level and the average energy at temperature T=100 K, of system consists of 5 energy levels ($\varepsilon1=0$, $\varepsilon2=100$ kB , $\varepsilon3=200$ kB, $\varepsilon4=400$ kB , $\varepsilon5=500$ kB), have degeneracies $g_1 = 0$, $g_2=1$, $g_3=2$, $g_4=3$, $g_5=4$. Using the following data.

(I)	0	-1	-2	-3	-4
Exp (-I)	2.78	0.367879	0.135335	0.049787	0.018316

b) Total microstates number, partition function and average energy for an ideal system forming by two identical and distinguishable particles occupied three energy levels with energies $0,1\varepsilon, 2\varepsilon$ and degeneracies 2,1,1 respectively.

c) The partition function , entropy , internal energy and Helmholtz free energy of a system of N electrons with two up and dawn energy levels with g1=g2=1 .

THER DQUISTION (15 marks)

Write about 30 words in:

a) Heat death of universe
b) Different between macrostates and microstates.

P .T . O

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16	Total wave function Ψ is zero

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

فيزياء حاسوبية

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 11/1/2017	TERM: FIRST	TOTAL ASSESSMENT MARKS: 100	TIME ALLOWED: 2 HOURS

Answer The Following Questions: **(25 mark)**

First Question:

a) Construct a flowchart to see if a number n is negative, positive, or zero and write the corresponding FORTRAN program.

b) Draw a flowchart to calculate the value of the function F(x) which is defined as:

$$F(x) = \begin{cases} 4x^3 & \text{when} \quad x \geq 0 \\ 3x + 7 & \text{when} \quad x < 0 \end{cases}$$

(25 mark)

Second Question:

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

b) Using **each** of LOGICAL IF and DO statements write a program to compute the values of the variable, a, which is given by the equation $a = 6b^3 + 3b + 5$. Knowing that the values of, b, is between -6 and 6 in increments of 0.2.

(25 mark)

Third Question:

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

b) Write a FORTRAN program to compute the following summations

$$sum1 = x_1 + x_2 + x_3 + \cdots \cdots \cdots \cdots \cdots \cdots \cdots x_n$$

$$sum2 = \sum_{i}^{n} \frac{1}{i^2 + 5}$$

c) Write a program to calculate factorial N.

(25 mark)

Fourth question:

a) By using MATHEMATICAL GO TO and formatted input and output write a Fortran program to calculate the value of the variable, Z, which is given by the Following equation:

$Z = \text{Tan}(XY)$	when	$A = 1$
$Z = X + 5Y$	when	$A = 2$
$Z = \lvert X^2 + Y^2 \rvert$	when	$A = 3$

b) Using nested DO loop write a program to print out the values of the variable a, which is given by the formula $a = 6b^2 + 15c^3 + d^4$ for the values of, b, c and d between -8 and 8 in increment of 0.1.

EXAMINERS	PROF.DR. G.A.GABALLA	

فيزياء كهرباء حيوية

	FACULTY OF SCIENCE DEPARTMENT OF PHYSICS			TANTA UNIVERSITY
	EXAMINATION FOR FRESHMEN (THIRD LEVEL) STUDENTS OF SPECIAL AND BIO-PHYSICS			
	COURSE TITLE:	ELECTRODYNAMIC I		COURSE CODE:PH3171
DATE: 21	Jan, 2017	TERM: FIRST	TOTAL ASSESSMENT MARKS: 100	TIME ALLOWED: 2 HOURS

Answer The Following Questions:

1) Compare between the following: (25 mark)
   a- Solenoidal and irrotational fields in Helmholtz theorem. (10 mark)
   b- Conductors and insulators for: the field inside- Gauss's Law- the boundary conditions.

2) a- State the Delta function in three dimension and evaluate; (10 mark)
   $J = \int_V (r^2 + 2)\,\nabla \cdot \left(\frac{\hat{r}}{r^2}\right) d\tau,$
   b- Consider a sphere of radius R containing charge of a constant density ρ_o inside while outside $\rho = 0$ find the electric field inside and outside the sphere. (15 mark)

3) a- Explain the separation variable method for three dimension in Cartesian coordinate and the suggestion solutions. (10 mark)
   b- Two infinite grounded metal plates lie parallel to the xz plane, one at y=0, the other at y = a (Fig. 1). The left end, at x = 0, is closed off with an infinite strip insulated from the two plates and maintained at a specific potential V_0. Find the potential inside this "slot ". (15 mark)

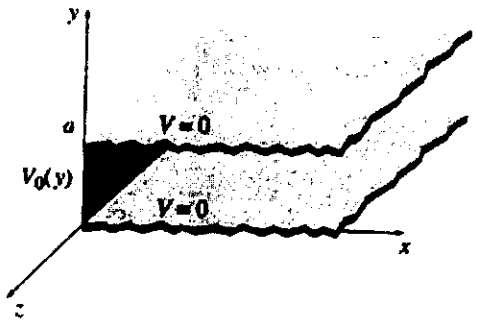

Fig. 1

4) a- Discuss the following: polarization in molecules- surface bound charge and volume bound charge. (10 mark)
   c- Given a charge q inside a spherical dielectric shell of inner radius a, and outer radius b. Find the electric polarization **P** and the bound charge density for r < a, a < r < b, and r > b. (15 mark) ---------- *Good luck*

Examiner	Dr.Nagwa M. Abdel-Moniem