




**Answer the following questions:**

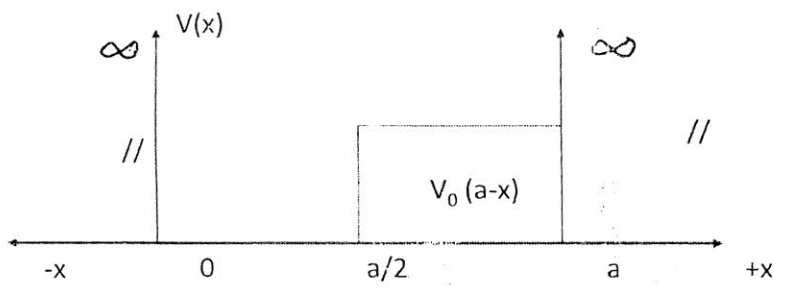
- 1- (a) Starting with the block diagram of 1-Bit digital comparator construct a 2-Bits digital comparator  
(4 Degrees)
- (b) Draw 4-Bits Parallel Adder and show how it can be converted to a 4-Bits Subtractor in both positive and negative cases  
(5 Degrees)
- (c) Discuss how a 4 -Bits Parallel Subtractor also can be used as 4-Bits Comparator  
(2 Degrees)
- 2- (a) Starting with the Truth Table of 1-bits digital Multiplexer simplify its Min Term, draw its logic circuit, and then reconstruct this circuit using only NAND gates  
(6 Degrees)
- (b) Write the different concepts of Binary Multiplication and draw a block diagram representing one of them  
(5 Degrees)
- 3- (a) Using the J-K of Flip Flops show how it can be used to construct both a 4 Bits Ripple binary counter and a 4 Bits BCD Counter  
(5 Degrees)
- (b) Explain the crystal structure of  $\text{BaTiO}_3$   
(5 Degrees)
- 4- Write a short note about the piezoelectric  $d_{33}$   
(11 Degrees)
- 5- What is the phenomena of electromechanical behaviour  
(11 Degrees)

**Best Wishes**

	TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF PHYSICS			
	EXAMINATION of (Fourth year) students of physics group			
	COURSE TITLE:	QUNTUM MECHANICS		COURSE CODE:24033
DATE:	6/6/2013	TERM:SECOND	TOTAL ASSESSMENT MARKS : 54	TIME ALLOWED: 3HOURS

**Answer the following questions:**

- 1- Apply the variation theory to determine the percentage error for the total energy of the helium atom? (11maks)
- 2- Use the trial wave function  $\phi(r) = A r e^{-Br}$  for the ground state of the hydrogen atom. Apply the variation method to determine the variational parameter (A and B) and energy? (11maks)
- 3- Consider a particle of mass (m) in a potential well as shown in Figure.



What is the lowest allowed energy in the first order perturbation theory?

(11maks)

- 4- Deduce relationship of scattering amplitude in three directions?

(11maks)

5- Construct the following matrices:

a-The Pauli spin matrix for neutron in the x-direction. (5marks)

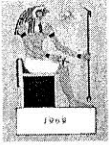
b-The momentum operator for the harmonic oscillator. (5marks)

GOOD LUCK

Examiner: Prof. Dr. Neima Z.Darwish

2014

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	TANTA UNIVERSITY- Faculty of Science -Department of Physics			
	EXAM FOR SENIORS STUDENTS OF GENERAL PHYSICS			
COURSE TITLE	Materials Science		COURSE CODE:PH4193	
DATE:	4- 1 - 2014	TERM: FIRST	TOTAL ASSESSMENT MARKS: 100	TIME ALLOWED: 2 HOURS

**First Question:**

1. Cite the four components that are involved in the design, production, and utilization of materials, and briefly describe the interrelationships between these components. (Give example). [10marks]
2. Briefly describe ionic, metallic, and van der Waals bonds and note which materials exhibit each of these bonding types. [15marks]

**Second Question:**

1. State and explain Brag's law to determine the interplanar spacing for crystal structures that has cubic symmetry. [10marks]
2. List the four different Imperfections types in solids. [10marks]
3. Name two types of Impurity point defects are found in solid solutions, then Provide a brief written about the factors affect these defects in solid, and finally Given examples of these defects. [10marks]

**Third Question:**

1. Sketch/describe unit cells for sodium chloride, cesium chloride, zinc blende, diamond cubic, and graphite. [15marks]
2. Briefly write short notes about the structure and properties of Carbon nanotube.[10marks]

**Fourth Question:**

1. Name and describe the different Atomic Point Defects that are found in ceramic compounds. [10marks]
2. Distinguish between crystalline and noncrystalline ceramics in Mechanics of Plastic Deformation. [10marks]

EXAMINER	DR. REDA EL-SHATER
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☺ BEST WISHES ☺

