Faculty of Science
Department of Physics

Undergraduate
Final Exam(50%)
2nd semester 2018-2019
Course: Radiation Physics
Code:P444
Section: Phys. and Phys./Chem
Time:3Hours Date: 18-6-2019

Assiut University

Question (1): **(30 Mark)**

a) Put [√] or [x]for each of the statement, then discuss your answer. (10 Mark)

1) The decay constant λ is defined as "the probability that a given nucleus will decay per unit time. What are the properties of the decay constant?
2) The radioactive equilibrium occurs when the half-life of the parent nucleus is more short-lived than the daughter nucleus.
3) Compton scattering refers to the inelastic scattering of photons for bound electrons.
4) The annihilation process is a source of photons with energy *0.511Mev*.
5) The electromagnetic waves (*EM*) include the whole electromagnetic spectrum such as γ-rays, X-rays,α particles, ultraviolet, visible, infrared, microwave, radar and radio wave.
6) In transient equilibrium, both number of atoms of parent N_1 and daughter N_2 decrease exponentially with time with the half-life of parent and the ratio N_2/N_1 remains constant".
7) The condition for β^+ decay to be possible is $M(A,Z)-M(A,Z+1) > 0$, where $M(A,Z)$ and $M(A,Z+1)$ are the atomic masses of parent and product nuclei.
8) The effects of chronic exposure become obvious after a short time.
9) Absorbed dose is measured in units of Sievert.

b) Write on the following: (10 Mark)

Photoelectric effect–Photomultiplier tubes –Nuclear Fission –Absorbed dose –Internal Conversion

c) What about Exposure of Radiation, Effects of Exposure, Exposure Limits and Exposure Reduction of Radiation? (10 Mark)

Answer Two (2) only of the following questions:

Question (2): **(10 Mark)**

1. Discuss in details the decay of radioactive element ${}^{A}_{Z}X$ by the emission of β^--particles. (7 Mark)
2. The element ${}^{131}_{53}I$ decays by emitting β^-- particles with maximum kinetic energy 0.608 MeV. After the emission of β^-- particles,each residual nucleus of ${}^{131}_{54}Xe$ is left in an excited state and emits γ-rays with total energy 0.364 MeV. Draw the energy level diagram for this decay in both mass and energy scales. Consider that the atomic mass of stable ${}^{131}_{54}Xe$ is 130.905085 u. (3 Mark)

Question (3): **(10 Mark)**

1. Consider n successive radioactive disintegration of the two radioactive elements P and Q as $P \rightarrow Q \rightarrow R$, where R is a stable element. If λ_1 and λ_2 are the decay constants of P and Q, respectively. Determine the number of Q atoms that present at instant time t. (7 Mark)

2. Consider radioactive series whose first two members P and Q have half-lives of 5 *hrs* and 12 *hrs*, respectively, while the third member is stable. Assume that there are initially 10^6 atoms of the first member and non of the second and third members. Calculate the number of second member Q after 4*hrs*. (3Mark)

Question (4): **(10 Mark)**

1. What is the ionization radiation and what are the different sources of it? (4Mark)
2. Discuss in details γ sources of radiation. (6Mark)

BEST WISHES **Instructor: Dr. Ghada Salaheldin**

Assiut University | Grade: Four

Faculty of Science | Course: 492f

Physics Department | Time: 3 Hours

Second Term Exam 2019

- Answer ONLY FIIVE of the following questions: (50 Marks: 10 *Each*)

1) Write a short account on the following:

   a) Thermoelectric and thermomagnetic coefficients.

   b) Energy band theory of solids.

2) Discuss in detail the lattice thermal conductivity at low and high temperatures in solids.

3) Explain the heat capacity of the electrons in metals.

4) Write a short account on the following:

   a) The thermoelectric effects in semiconductors.

   b) Conduction of heat in semiconductors.

5) Discuss how to measure and calculate the thermal properties of solids using the plane-temperature wave technique.

6) Explain the experimental method and the calculation of the thermophysical properties of ternary alloys as Bi-Sb-Te system.

Good Luck

Examiner: Prof. Mostafa Saad Mostafa

جامعة أسيوط | امتحان الفصل الدراسي الثاني 2018-2019 م | الفرقة: رابعة علوم

كلية العلوم | المقرر: فيزياء الليزر وتطبيقاتها (472 ف) | الزمن: ثلاث ساعات

قسم الفيزياء | تاريخ الاختبار 2019/6/11 م | الممتحن: د. محمد العسيلي

أجب عن خمسة أسئلة فقط مما يأتى:-

السؤال الأول

أ- استنتج العلاقة بين معاملات اينشتين (5 درجات)

ب- اذا كان طول موجة شعاع ليزري $\lambda = 500\ nm$ احسب النسبة بين معاملات اينشتين. ثم احسب كثافة الاشعاع عند درجة حرارة $T=4500\ ^0C$ (3 درجات)

ح- سقطت موجة كهرومغناطيسية ترددها $\nu=5x10^{14}\ Hz$ على مادة . إحسب النسبة بين تعداد المستوي الاول الى تعداد المستوى الثاني عند درجة حرارة $1027\ ^oC$ (درجتان)

السؤال الثاني

ا-استنتج قيمة معامل كسب الاشارة الصغير ومعامل التكبير لاشعة الليزر (5درجات)

ب- تجويف ليزري يتكون من مرآتين ذو انعكاسية $R_1=100\%$ و $R_2= 95\%$ وطوله $10\ cm$ استخدم لتوليد ليزر النيتروجين احسب قيمة الشرط الحرج لتوليد اشعة ليزر التيتروجين اذا علمت ان مساحة المقطع العرضي للانتقال $\sigma = 8x10^{-19}\ cm^2$ (3 درجات)

ج- احسب معامل الامتصاص لمادة سمكها $10mm$ اذا علمت ان $I/I_0 = 50\%$ (درجتان)

السؤال الثالث

ا-احدى خصائص اشعة الليزر هي الترابط اشرح هذة الخاصية بالتفصيل مع شرح تجربة توضح الترابط المكاني التام (5 درجات)

ب- استخدم مصدر ليزري ذات الطول الموجي $\lambda=600\ nm$ تجربة يونج ذو الشق المزدوج فتكونت الهدبة الثانية المضيئة على بعد $3cm$ من النقطة المركزية . احسب المسافة الفاصلة بين الفتحتين اذا علمت ان المافة بين الشاشة والفتحتين $R=1.3\ m$ وما هو الوضع الزاوي للهدبتين التاليتين. (3 درجات)

ج- سقطت حزمة ليزر He-Ne ذات الطول الموجي $\lambda=632\ nm$ على حاجز به فتحة نصف قطرها $0.02\ mm$ احسب زاوية انفراج الشعاع ذو الترابط المكاني التام و زاوية انفراج الشعاع ذو الترابط المكاني الجزئ (درجتان)

اقلب الصفحة

السؤال الرابع

ا- اشرح كيف يمكن حساب تردد الانتقالات الليزرية في ذرة الهيدروجين باستخدام النظرية الكمية لبوهر (6 درجات)

ب- إذا كان طول موجة شعاع ليزري $\lambda=700\ nm$ ناتج من انحلال ذرات الهيدروجين من مستوى الطاقة الرابع. الى مستويات طاقة اقل. احسب رتبة المدار النهائي. (4 درجات)

السؤال الخامس

ا- اذكر مميزات وعيوب استحدام الليزرفي التطبيقات الصناعية (4درجات)

ب- اذكر انواع الليزرات ثم اشرح بالتفصيل كيفية الحصول على ليزر الياقوت (3 درجات)

ج- شريحة زجاجية استخدمت لمقياس ميكلسون فسمحت بمرور 100 هدبة احسب سمك الشريحة اذا علمت ان طول موجة شعاع الليزر المستخدم $\lambda=400\ nm$ و معامل انكسار مادة الشريحة 1.5 واذا استبدلت هذه الشريحة الزجاجية بغشاء رقيق له نفس السمك ومعامل انكساره 1.4 فكم من الهدب يسمح بمرورها هذا الغشاء. (3 درجات)

السؤال السادس

ا- ما هي الامور التي يجب مراعاتها عند استخدام الليزر في التطبيقات الصناعة (4 درجات)

ب- اشرح بايجاز كل من :-

ليزر المستويات الثلاثة - الانبعاث المستحث - طرق ضخ الطاقة (3 درجات)

ج- اذكر الشروط التي يجب توافرها في التجاويف الرنانه ثم اشرح كيف يمكن حساب التردد الرنيني لتجويف كروي متحد المركز (3 درجات)

انتهت الأسئلة والله الموفق

ثابت بولتزمان $k=1.38x10^{-23}\ j/k^0$ ثابت بلانك $h=6.625x10^{-34}\ j.sec$

سرعة الضوء $C=3x10^8\ m/sec$ شحنة الالكترون $e=1.6x10^{-19}\ C$

ثابت رايدبرج $R=10.97x10^6\ m\text{-}1$

Assiut university	**Final Exam for physics of**	**Phys & phys/chem.**
Faculty of science	**semiconductors & thin film and their**	**4th level**
Physics department	**application "Phys. 451"**	**Date:21/05/2019**
	May- 2019	**Time allowed: 3hours**

Answer five only from the following questions: (50 marks)

-All questions are of equal marks (10 Marks)
- Question **No.1 must** be answered
-Use the following physical constants if you need them:
$e=1.6\times10^{-19}$C. , $m_0=9.1\times10^{-31}$ Kg, $K=1.38\times10^{-23}$J/k, $h=6.625\times10^{-34}$j/s
-For Si at 300k: $n_i=1.5\times10^{10}/cm^3$, $\varepsilon_{si}=12\times8.85\times10^{-14}$ F/m ,

Part.I: Answer this question [please put your answer in a table]

Q.1: **(10 Marks)**

Choose the correct answer for the following statements:

1- The density of states function inside the conduction band $D_c(E)$ increases with:

a)- E b)- E^2 c)- $E^{1/2}$ d)-E^{-2}

2-For a p-type semiconductor sample, the acceptor ionization energy equals:

a)- E_A b)- E_A-E_v c)- E_c-E_D d)-E_c-E_v

3-The probability of an energy state being occupied by an electron F(E) at $E=E_f$ and at T=0K equals:

a)-one b)-1/2 c)- >1/2 d)- zero

4-The electron and hole mobility in semiconductors increases with:

a)- temperature b)- doping density c)- effective mass d)- None of these

5-The d.c conductivity of n-type semiconductors increases with increasing:

a)-only T b)- only N_d c)-N_d and T d)- None of these

6- During electronic devices fabrication using Si wafers technique, the most easier step is :

a)-ion implementation b)- Si oxidation
c)- SiO2 lithography d)- Annealing& Diffusion

7- The Epitaxial growth technique can be used for growing thin films of

a)- amorphous structure b)- sigle crystalline
c)- ploy-crystalline d) all these

8- For a P-N diode at equilibrium, the built-in electric field E(x) equals zero at :

a)- $x=x_p$ b)-_$x>x_n$ c)- x=0 d)-$x=x_n$

9)- The breakdown potential due to impact ionization (V_B) is proportional to:
a)- N_d b)-N_a c)-N_a+N_d d)- I/Na+1/N_d

10)- The emitted photons from a LED is mainly due to:
a)- photo generation b)-radiative recombination
c) trapping Recombination d)- b and c

Part.II [Answer four questions only from the following]: (40 Marks)

Q.2: **(10 Marks)**

a)- Define the following: (5 Marks)
-the Fermi function f(E), the effective mass of charge carriers, the recombination centers, the depletion layer in p-n diode, the ion implantation.

b)- Consider a si sample at 300K that is doped with donner impurity atoms to a concentration of Nd=5x10^{15}/cm^3 . The excess carrier life time is 2x10^{-7}s.
i)- Determine the thermal equilibrium recombination rate of holes.
ii)- If excess carriers are photo generated such that n'=p"=10^{14}/cm^3. What is the excess hole recombination rate at this condition. (5 Marks)

Q.3: **(10 Marks)**

a-Discuss in details the factors play the dominant rule at the carrier mobility (μn and μp) for doped semiconductor samples at equilibrium.[express using graphs and mathematical expressions]. (5 Marks)

b)- Consider a silicon sample at 300K. A Hall effect device has been fabricated with the following geometry: d=5x10^{-3}cm, W= 5x10^{-2}cm, and L= 0.5cm. The electrical parameters measured are: I_x=0.50mA, V_x= 1.25V and B_Z=6.5x10^{-2} Tesla. The Hall field E_H= - 16.5mvV/cm . Determine: (5 Marks)
i)- The Hall voltage. ii)- The conductivity type
iii)- The majority carrier concentration. iv)- The majority carrier mobility

Q.4 : **(10 marks)**

a)-State the reason(s) for the following: [using mathematical expressions when possible]. (5 Marks)
i)- The decrease of W_{dep} for a P-n diode with increasing the forward biased V_f.
ii)- The decrease of solar cell efficiency with increasing the environment temperature.
iii)- We cannot use Si to fabricate IR photodiode.
iv)- In a p-n diode circuit under a constant forward biased the current decreases with increasing its temperature .
v)- Si material still a good candidate for solar cell fabrication.

b)- A silicon p-n Junction at 300k and zero bias, has impurity doping concentrations of $N_A = 10^{16}/cm^3$ and $N_d = 10^{18}/cm^3$.[use the constants for Si given above]

calculate : (5 Marks)

i)- The built in potential ϕ_{bi} .

ii)- The width of the depilation layer W_{dep} at equilibrium and at a reverse biased V_R=5V.

iii)-The depilation capacitance for unite area of the junction C_{dep} at equilibrium.

Q.5: **(10 Marks)**

a)- Compare between resistive heating and sputtering techniques for thin film deposition [the comparison includes : the main idea, graphic representation, advantageous and disadvantageous]. (6 Marks)

b)- prove that the mobility(μ) and the diffusion coefficient (D) for charge carriers in semiconductors are related to each others by the well known "Eientien " relation $D = (KT/q)\mu$ (4 Marks)

Q.6: **(10 Marks)**

a)- Using only graphic representation to express the following: (6 Marks)

i)- Direct and indirect band gap semiconductors.

ii)-The Bridgman method for growing single crystal from melt.

iii)-The chemical vapor deposition (CVD) for thin film deposition.

b)- Explain briefly the structure, main idea, different types , performance and efficiency of Si solar cell. (4 Marks)

With my best wishes **Prof. Dr. /A. Y. Abdel-Latif**

Assiut University	**Date: 12/6/2019**
Faculty of Science	**Time Allowed: 2 hours**
Concrete Technology Final Exam	**Total Grades: 50 grades**

Notes: Exam consists of 6 pages, Solve all questions

Question No. 1: Multiple Choice, choose the appropriate answer "Just write in the answer paper the question's no. and the letter of the answer a, b, c, d (12 marks)

1. Concrete mainly consists of

A. cement
B. aggregates
C. admixture
D. water
E. all the above.

2. Proper proportioning of concrete, ensures

A. desired strength and workability
B. desired durability
C. resistance to water
D. all the above.
E. none of these

3. Vicat's apparatus is used for

A. fineness test
B. consistency test
C. setting time test
D. soundness test
E. compressive strength test.

4. Concrete grade 350 Kg/cm^2 includes around ..... of cement

A. 350 kg
B. 150 kg
C. 350 g
D. 3 bags
E. 450 kg

5. Internal friction between the ingredients of concrete, is decreased by using

A. less water
B. fine aggregates
C. rich mix
D. more water and coarse aggregates
E. none of these.

6.Shrinkage in concrete can be reduced by using

A. low water cement ratio
B. less cement in the concrete

C. proper concrete mix
D. presaturated aggregates
E. all the above.

7. High strength concrete may has grade = kg/cm^2
A.200
B.225
C.275
D.350
E.700

8. Water required per 7 bags of cement, is
A. 175 liter
B. 100 liter
C. 350 liter
D. 7 kg
E. 25 kg

9. Pick up the correct statement from the following:
A. Segregation is necessary for a workable concrete
B. Consistency does not affect the workability of concrete
C. If the slump increases, workability decreases
D. If the concrete mix is dry, the slump is maximum
E. None of these.

10. Specified compressive strength of concrete is obtained from cube tests at the end of
A. 2 days
B. 8 days
C. 14 days
D. 28 hours
E. 28 days.

11. Pick up the incorrect statement from the following:
A. Water cement paste hardens due to hydration
B. During hardening cement binds the aggregates together
C. Cement provides strength, durability and water tightness to the concrete
D. Water cement ratio has no impact on concrete compressive strength
E. All the above.

12. Permissible compressive strength of M 300 concrete grade is
A. 100 kg/cm^2
B. 150 kg/cm^2

C. 200 kg/cm^2
D. 250 kg/cm^2
E. 300 kg/cm^2

13. Water cement ratio is
A. volume of water to that of cement
B. volume of concrete to that of water
C. weight of concrete to that of water
D. weight of water to that of cement
E. both (a) and (d) of the above.

14. The factor which affects workability, is
A. water content and its temperature
B. shape and size of the aggregates
C. grading and surface textures of the aggregates
D. air entraining agents
E. all the above.

15. Pick up the correct statement from the following:
A. Water enables chemical reaction to take place with cement
B. Water lubricates the mixture of gravel, sand and cement
C. Water is not required for hydration of cement
D. Strength of concrete structure doesn't depend upon its workability
E. Both (a) and (b) of the above.

16. The grade of concrete M 700 means that compressive strength of a 15 cm cube after 28 days, is
A. 100 kg/cm^2
B. 600 kg/cm^2
C. 550 kg/cm^2
D. 700 kg/cm^2
E. 600 kg

17. Pick up the correct statement from the following:
A. An increase in water content must be accompanied by an increase in cement content
B. Angular and rough aggregates reduce the workability of the concrete
C. Large size aggregates increase the workability due to lesser surface area
D. The slump of the concrete mix decreases due to an increase in temperature
E. All the above.

18. Higher workability of concrete is required if the structure is
A. made with cement concrete
B. thick and reinforced

C. thin and heavily reinforced
D. thick and heavily reinforced.
E. None of these

19. Pick up the incorrect statement from the following:
A. Tricalcium silicate (C_3S) hydrates rapidly
B. Tricalcium silicate (C_3S) generates more heat of hydration
C. Tricalcium silicate (C_3S) develops early strength
D. Tricalcium silicate (C_3S) has more resistance to sulphate attack
E. None of these.

20. The heat of hydration of cement is dependent on:
A. Composition of cement
B. Fineness of cement
C. Temperature
D. All of the above
E. None of these

21. Which type of concrete can be ready mix concrete:
A. Prestressed Concrete
B. High strength Concrete
C. Self-Compacting Concrete
D. All of the above
E. None of these

22. Shrinkage:
A. Occurs in Concrete when it got hardened in air
B. It causes problems in concrete in all causes
C. Drying shrinkage is not affected by concrete mix components
D. All of the above
E. None of these

23. Creep:
A. is a time dependent
B. value decreased as compressive strength increased
C. is affected by cement type
D. All of the above
E. None of these

24. Durability:
A. is concrete resistance against deterioration
B. includes concrete resistance for absorption and permeability

C. is affected by cement type
D. All of the above
E. None of these

Question No. 2: Indicate whether the sentence or statement is true or false (10 marks)

1. In cement, the sum of $C_3S + C_3A = 75\%$
2. Concrete consists of = Cement past 64% + Aggregate 35% + Air voids 1%
3. When increasing water cement ratio, it has great negative impact on concrete's compressive strength
4. Using clean aggregate is not an important factor while mixing concrete.
5. Concrete strength usually gives an overall picture of the quality of concrete because it is directly related to the structure of cement paste.
6. Modulus of Rupture equal 12-20 % of tensile strength.
7. If Cement / Aggregate ratio is 1:4 so it is rich concrete mix while if the ratio reached 1:8 the mix become so poor
8. The quality control of steel structures is more guaranteed than concrete structures.
9. C_3A causes many problems in cement and it can be eliminated
10. In traditional concrete, the failure occurred in the cement paste
11. The factor that increase permeability of concrete is mainly the aggregate not the cement past
12. Both of steel reinforcement and effective curing have good impact on decreasing shrinkage
13. Plastic shrinkage occurs after 24 hours of concrete casting
14. Water cement ratio & weather has no impact on plastic shrinkage while it effects autogenous shrinkage.
15. Creep is defined as the decrease in strain under a sustained constant stress after considering other time-dependent deformations.
16. Around 75% of concrete shrinkage occurred during the first year of concrete age.
17. The internal factors are only the factors that effect concrete's durability
18. Concrete is considered as a permeable material by nature.
19. Both of slump test & schmidt hammer are non-destructive testing of concrete
20. Consistency is one of the main properties for hardened concrete

Question no. 3: Essay (18 marks)

a. Write short notes about

1. Concrete durability (including definition, reasons and influencing factors)
2. Non-Destructive testing of concrete (including definition, Applications & state two examples).
3. The role of admixture in enhancing concrete properties (state three types of admixtures and their functionalities).
4. Concrete three main phases (indicates the time line for each phase)

5. Discuss the influence of water cement ratio (w/c) on concrete (Illustrative drawing is necessary) .
6. Creep (Illustrative drawings are necessary)

b. Differentiate between:

1. Architectural & decorative concrete
2. Permeability& Absorption
3. Concrete grades 800 Kg/cm^2 & 300 Kg/cm^2
4. Bending & Shear Strength

Question No. 4: Problems solving (10 marks)

a. If w/c ratio is 50%, cement content in 1 m^3 = 7 bag, and admixtures ratio is 2.5%, if the total concrete volume is 20 m^3 determine the total needed admixture (in kg) for the whole concrete volume.

b. Design the concrete mix by weight & volume using absolute volume method, considering the below information:

- The fresh concrete consistency is Plastic
- Consider water cement ratio = 45%
- The needed compressive strength after 28 days = 300kg/cm^2
- The passed percentage of aggregate through sieve 3/16 = 30%
- Specific weight of cement = 3.15
- Specific weight of aggregate (sand & gravel) = 2.65
- Volumetric weight of aggregate (sand & gravel) = 1700 Kg/cm^2

With my best wishes

Assiut University | Physical Measurements using a computer | المستوى: الرابع
Faculty of science | P 462 | 29/5/2019
Physics department | 2018–2019 | Time: 3 hours

Question No.1 (7.5 deg.),,,, Choose the correct answer-(Or answers):

1-A quantity having continuous values is:
A-a digital quantity B-an analog quantity C- a binary quantity D-a natural quantity

2-A quantity having a discrete set of values:
A-a digital quantity B-an analog quantity C- a binary quantity D-a natural quantity

3- Temperature versus time can be drawn as a graph of:
A-a digital quantity B-an analog quantity C- a binary quantity D-both answers A and B

4- Digital has certain advantages over analog in electronic applications:
A- True phrase B- False phrase C- Dubious ferry D- I do not know

5- Compared to analog systems, digital systems:
A- are less prone to noise B- can represent an infinite number of values
C- can handle much higher power D- all of the above

6- (CD) player is an example of a system using:
A-a digital method B-an analog method C- a sound method D--both answers A and B

7- To change the digital data into an analog signal (Vice versa) we use:
A-(DAC) B-(ADC) C- (LBC) D--both answers a and b

8- The rate at which a periodic pulse waveform repeats itself:
A-Rise time B- frequency C- pulse width D- period

9- To transfer 8 bits in series, it takes ..... time interval
A-One B- 16 C- 8 D-both answers A and C

10- AND, OR and NOT gates can be used to form:
A- storage devices B- comparators C- data selectors D- all of the above

11-The device used to convert a decimal number into some coded form (binary code) is:
A- multiplexer B-encoder C-decoder D-register

12 The device used to convert a binary number to a decimal form is:
A- multiplexer B-encoder C-decoder D-register

13. A function that required to retain binary data for a period of time:
A- counting B-printing C- Storage D-register

14- An example of a devices used for storing large n's of bits is:
A-semiconductor B-the flip flop C-ROM & RAM D-the register

15- An example of a device used LASER beams to store and retrieve data is:
A- semiconductor memories B-the flip flop C- magnetic memories D-the register

Question No. 2: (18 deg.) Choose and discuss the correct answer-(Or answers):

1. Groups of bits (combination of 1s and 0s), called:
A-codes B-numbers C- letters D- symbols E- all the above

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2. The time interval on the leading edge of a pulse between 10% and 90% of the amplitude is the:

A-rise time B-fall time C-pulse width D-period

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3. The reciprocal of the frequency of a clock signal is the..... OR the fixed interval that a pulse waveform repeats itself, is called:

A-rise time B-fall time C-pulse width D-period

.....

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.....

4. The time measurement between the 50%point on the leading edge to the 50% point on the trailing edge of the pulse is called:

A-rise time B-fall time C-pulse width D-period

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5. a pulse in a certain wave form occurs every 10ms.The frequency is:

A-1 kHz B- 1 Hz C-100 Hz D-10 Hz

.....

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6- If the period of the clock signal is 500 ps, the frequency is:

A-20 MHz B- 200 MHz C-2 GHz D-20 GHz

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7- If binary data are transferred at the rate of 10 million bits per sec. (10Mbits/s) how long it takes to parallel transfer 16 bits on 16 Lines? How long it takes to serially transfer 16 bits?

A-10 ns - 16μs B-100 ns – 1.6μs C-1 ns - 16μs D- 100 ns - 16μs

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8- To transfer 8 bits in parallel, it takes ..... time interval

A-one B- 64 C- 8 D- 16

.....

9- Using the operator AND to combine concept terms is a good way to increase the number of records retrieved in a search. (True OR False)

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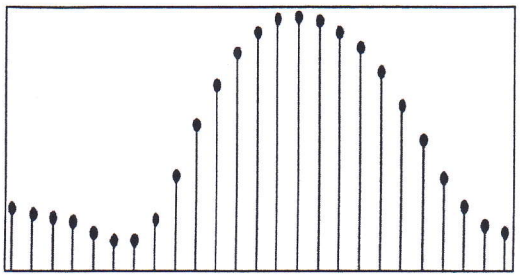
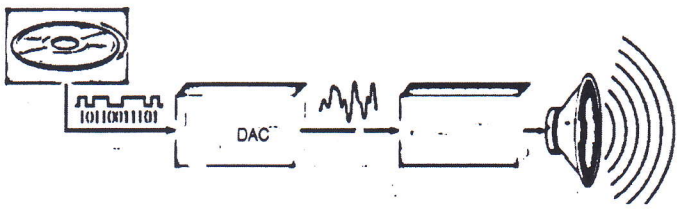
Question No.3 (24.5 deg.)

(A). Comment shortly on the following shapes :(18 deg.)





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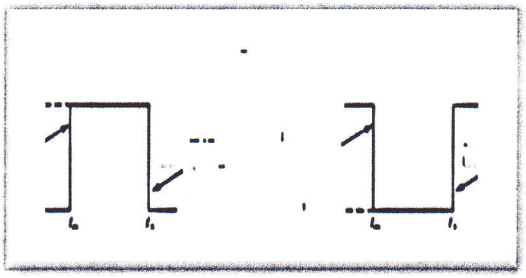

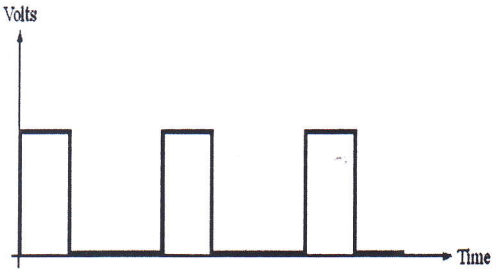

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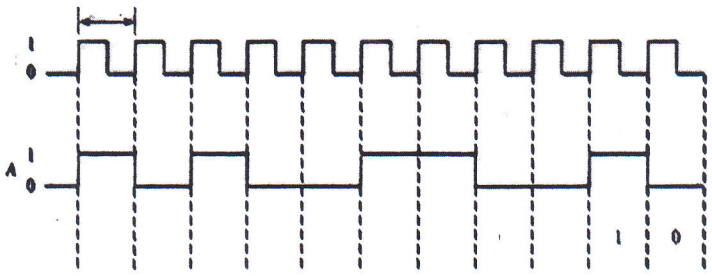

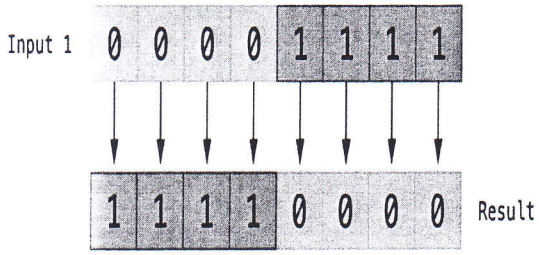

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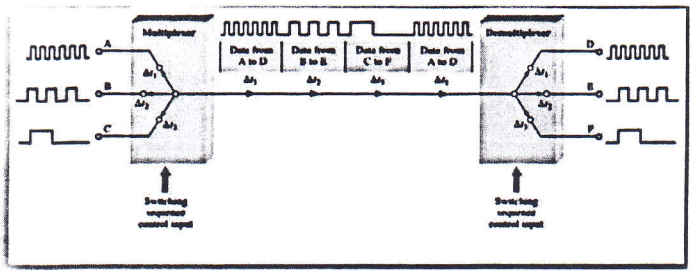
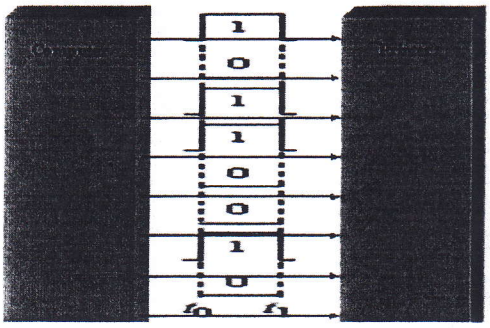
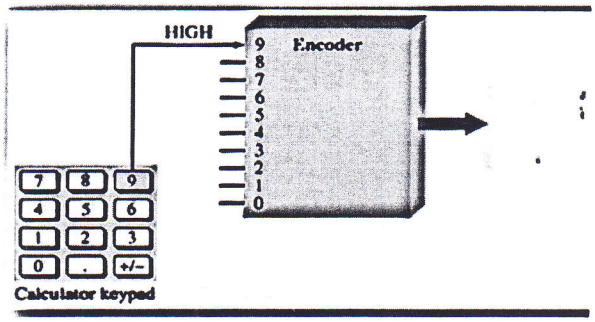
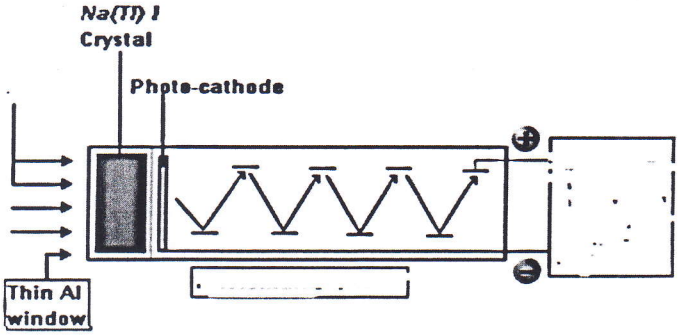
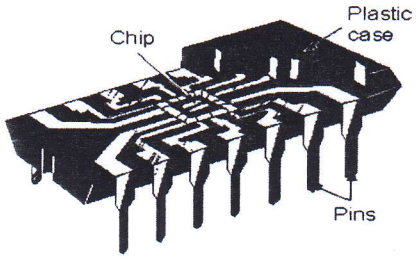
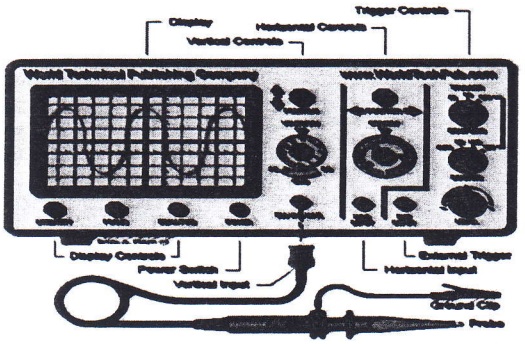



1
0
1
1
0
0
1
0


HIGH
Encoder
9
8
7
6
5
4
3
2
1
0
7
8
9
4
5
6
1
2
3
0
.
+/-
Calculator keyped

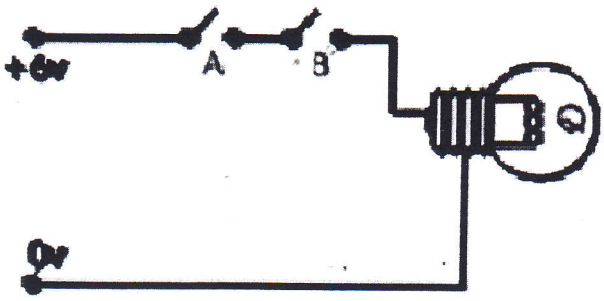

Na(Tl) I
Crystal
Photo-cathode
Thin Al
window


Chip
Plastic
case
Pins

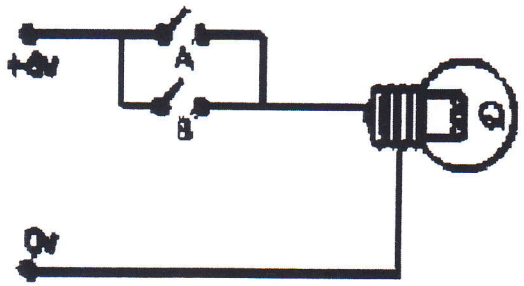


(B) Complete the following tables:(6 deg.)

A	B	Q

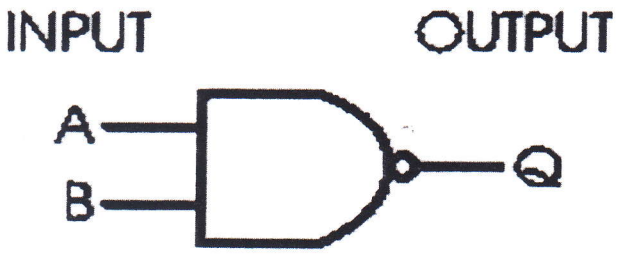


A	B	Q



NAND gate

A	B	Q
0	0	1



حسام وحيد ___Best wishes_____ إنتهت الاسئلة مع التمنيات بالتوفيق ____

Draft

جامعة أسيوط	امتحان دور يونيه 2015م	الفرقة : الرابعة
كلية العلوم	مقرر 432 ف	الزمن : 3 ساعات
قسم الفيزياء	أطياف ذرية وجزيئة	الشعبة : فيزياء

أجب عن خمسة أسئلة فقط مما يأتي

1- اشرح تأثير زيمان العادى وكيف تفسره ثم احسب إزاحة زيمان. (10 درجات)

2- اشرح قاعدة هوند ومنها احسب الحد الطيفى الاساسى لكل من الكروم و الكوبالت والنحاس علما بان العدد الذرى لكل منهم هو 24 ، 27 ، 29 على الترتيب. (10 درجات)

3- أ- اكتب مقال مختصر عن طيف الامتصاص فى الجزئ ثنائى الذرية. (5 درجات).

ب- اكتب مقال مختصر عن الطيف المستمر فى الجزئ ثنائى الذرية. (5 درجات)

4- اشرح بالتفصيل تركيب وطاقة وطيف الجزئ ثنائى الذرية كمذبذب غير توافقى . (10 درجات)

5- الجدول التالى يبين الاعداد الموجية لبعض الخطوط الطيفية للحزمة (0 – 0)

J	R(J)	P(J)
0	21199.81	
1	21202.88	21193.25
2	21205.74	21189.97
3	21208.52	21186.41
4	21211.12	21182.66
5	21213.58	21178.88
6	21215.58	21171.82

أ- أوجد الثوابت الدورانية $(\overline{B}, \overline{B})$ عند العدد الكمى J=3.

ب- أحسب موضع رأس الحزمة وفى أى فرع هى.

ج- أحسب الإزاحة بين رأس الحزمة وأصل الحزمة. (10 درجات)

6- اشرح بالتفصيل تركيب وطاقة وطيف الجزئ ثنائى الذرية كقمة متماثلة. (10 درجات)

Assiut University
Department of Physics
Quantum Mechanics 2 – Code P411 – Final Exam (50 pts.)

June 02, 2019 **Time: 3 hours**

Answer the following question: (*all questions carry the same weight* 10 pts)

1- Given the wave function: $\Psi_{100}(r,\theta,\phi)=\frac{1}{\sqrt{\pi a^3}}e^{-r/a}$

(a) **What** is the probability that an electron in the ground state of hydrogen will be found inside the nucleus?

(b) **Calculate** the exact answer, assuming that the wave function is correct all the way down to r = 0. Let b be the radius of the nucleus.

(c) **Expand** your result as a power series in the small number $\varepsilon \simeq 2b/a$, provided that b<<a.

2- Use the recursion formula $a_{j+1}=\frac{2(j+\ell+1-n)}{(j+1)(j+2\ell+2)}a_j$ **to confirm that** when $\ell = n-1$ the radial wave function takes the form $R_{n(n-1)}(r)= N_n\, r^{n-1}\, e^{-r/na}$ and **determine** the normalization constant N_n by direct integration.

3- Construct the matrix $\hat{S}_r$ representing the component of spin angular momentum along an arbitrary direction r. Use spherical coordinates, so that

$$\hat{r}=(\sin\theta\cos\theta)\hat{i}+(\sin\theta\sin\theta)\hat{j}+(\cos\theta)\hat{k}$$

Find the eigenvalues and normalized eigenspinors of $\hat{S}_r$.

4- Construct the spin matrices (S_x, S_y, and S_z) for a particle of spin 1. How many eigenstates of S_z are there? Determine the action of S_z, S_+, and S_- on each of these states. **Follow** the procedure used in the lecture for spin 1/2.

5- For indistinguishable particles we have $\Psi_{\pm}(r_1,r_2)=A\left[\Psi_a(r_1)\Psi_b(r_2)\pm\Psi_b(r_1)\Psi_a(r_2)\right]$

(a) If Ψ_a, Ψ_b are orthogonal, and both normalized, **what** is the constant A?.

(b) If $\Psi_a=\Psi_b$ (and it is normalized), **what** is A?. (This case, of course, occurs only for bosons.)

*****Good Luck***** **Prof. Dr. A. A. Ebrahim**

جامعة أسيوط - كلية العلوم – قسم الفيزياء
جمهورية مصر العربية – أسيوط - ت : ٠٠٢٠٨٨٢٣٣٣٨٣٧ فاكس : ٠٠٢٠٨٨٢٣٤٢٧٠٨

Final Exam-Second Term: (2018/2019) - Course Title:
Physics of Low Temperature P- 422- Time: 3h - Prof. Dr. Ahmed Sedky

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Answer the following questions:

Q1(10 marks):

(a) Explain by the equations and diagrams the mechanism of BCS theory for electron pair in superconductors.

(b) Calculate δ_{ns}, H_c, H_{c1}, H_{c2}, H_{c3} and I_c at Hc_2. for cylindrical superconductor of radius 2 mm (G-L parameter = 0.801 and density of pairs = 12.16×10^{21} /m^3).

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Q2 (10 marks):

(a) Calculate the specific heat coefficient of a superconductor if (T_c = 150 K , $H_{c1}(100)$ = 6000 A/m and ρ_{300} = 5 mΩ.cm).

(b) Derive an expression for London theory in superconductors.

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Q3(10 marks):

(a) Calculate the size of electron pairs in high T_c superconductors and compare it with the normal state.

(b) Prove that the free energy of a superconductor in zero field is lower than that of normal state.

(c) Calculate by nm the spacing of vortex lines of a superconductor if G-L parameter is 0.955, pinning radius is 1.2 nm and $\rho_{f=} 2\rho_n$.

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Q4(10 marks):

(a) Prove that $E_g(0) = 3.52K_BT_c$, and then explain why it is only applicable for weakly coupled superconductors.

(b) Explain with the diagram how you can determine the flux flow resistance along a flat strip of type (II) in mixed state.

(c) Clarify in details how the flux flow occurs in a superconductor, and then explain with the diagrams how you can determine the activation energy of flux bundles.

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Q5(10 marks):

(a) Describe with the required diagrams the behavior of specific heat in superconductors.

(b) Write the type of crystal structure, T_c, J_c (0) and H_{c2} for B: 2223 and FeSeT systems.

(c) Define surface sheath in type (II) superconductor, and then prove that type (1) can carry also surface sheath.