



University of Technology
Department of Applied Sciences
Final Examination ٢٠١٤/٢٠١٥



Subject : scientific research approach
Branch : math, laser, physics.
Examiner : Dr. Salam J. Shihab

Class : fourth year
Time : ٣ hours
Date :

ملاحظة: الإجابة عن خمس أسئلة فقط: (Just Five Questions)

السؤال الأول: ما هو دور الإشكال التوضيحية (Illustrations) في البحث العلمي، وضح ذلك وبين أنواع الإشكال، والأمور الواجب مراعاتها في إعداد الشكل وأآلية الترقيم. (fourteen degree)

السؤال الثاني: يتم التفريق بين القانون العلمي (Scientific Law) والنظرية العلمية (Scientific Theory) على أساس الجانب التطبيقي والبرهاني لكل منهما، وضح ما هي النظرية العلمية والفرق بينها وبين القانون العلمي؟ (fourteen degree)

السؤال الثالث: اجب عن اثنان فقط :

- ١- النظرة إلى نظرية الكم (Quantum Theory) بين الفيزياء الكلاسيكية والحديثة. (Seven degree)
- ٢- بقي النظام السيني مرجعاً معتمداً في الحساب على الرغم من معرفة العراقيين القدماء بالنظام العشري. (Seven degree)

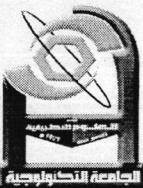
٣- الملاحظة البنائية في البحث العلمي. (Seven degree)

السؤال الرابع: حول رينيه ديكارت (Rene Descartes) الرياضيات من مجرد علم نظري غير قابل للتطبيق إلى علم يقيني من خلال المبرهنات الرياضية ... ووضح مراحل البرهان الرياضي؟ (fourteen degree)

السؤال الخامس: وضح معنى التجربة العلمية (Scientific experiment) وأنواعها والفرق بينها وبين الملاحظة العلمية (Scientific observation)؟ (fourteen degree)

السؤال السادس: الفيزياء في نشأتها كانت نتاج لعلاقة الحركة مع الزمن (Movement and time)، وضح هذا الجانب من خلال قوانين التعجيل (Accelerate Laws) عند غاليليو (Galileo Galilei) والحركات عند نيوتن (Isaac Newton)؟ (fourteen degree)

I wish good luck to answer



University of Technology
Department of Applied Sciences
Final Examination
2014 -2015



*Subject : computer science
Branch : applied Physics
Examiner : Dr. fouad shaker*

*Class : 4th year
Time : 3 hours
Date :*

أجب عن اربع اسئلة فقط

س١: في الجدول المبين أدناه إذا كان راتب الموظف أكثر من ١٠٠٠٠ دينار فانه يحصل على مكافأة ٨% ويتم خصم ضريبة ٥% وغير ذلك تكون المكافأة ٧% والضريبة ٤% ، وإذا كانت الوظيفة (موظف مبيعات) يتم صرف عمولة ٣%. جد قيمة المكافأة وقيمة الضريبة وصافي الراتب وقيمة العمولة كلا على حده باستخدام الدالة (If) حسرا. (١٥ درجة)

| G | F | E | D | C | B | A | |
|-------------|---------|---------|----------|--------|-------------|-------|---|
| صافي الراتب | العمولة | الضريبة | المكافأة | الراتب | الوظيفة | الاسم | 1 |
| | | | | 20000 | مدير | سالم | 2 |
| | | | | 11000 | محاسب | فادي | 3 |
| | | | | 6000 | موظف مبيعات | سننس | 4 |
| | | | | 4500 | موظف مبيعات | كامل | 5 |
| | | | | 3000 | حارس | حاتم | 6 |

س٢- ما هي مكونات بيئه نظم قواعد البيانات؟ بين هذه المكونات مع شرح تفصيلي لدور و عمل كل منها.
(١٥ درجة)

س٣: صمم جدول الظرف التالي باستخدام الاكسيل وبالاعتماد على المرجع المطلق من خلال وضع الصيغه الصحيحه في كل خلية. (١٥ درجة)

| G | E | D | C | B | A | |
|---|---|---|---|---|---|-----|
| | 5 | 4 | 3 | 2 | | 1 |
| | | | | | | 3 2 |
| | | | | | | 4 3 |
| | | | | | | 5 4 |
| | | 1 | | | | 6 5 |
| | | | | | | 6 |



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س، ما هي أنواع البيانات المتوفرة لحقول الجدول في اكسس؟ اذكرها مع شرح موجز لعمل كل منها.
(١٥ درجة)

س، ما هي الدوال الخاصة بالعد اذكرها مع ذكر الصيغة العامة لكل دالة ثم اذكر شرح موجز لكل منها.
ب - من جدول غيابات العمال بالنظام الأسبوعي والمبين في أدناه استخدم الدالة الملائمة لحساب عدد أيام الحظور وایجاد أجور كل عامل اذا كانت اجور اليوم الواحد من العمل تساوي (1000) دينار .
(ملاحظة: الفراغ يعني حضور)
(١٥ درجة)

جدول غيابات عمال بنظام الأسبوع :

| J | H | G | F | E | D | C | B | A | |
|--------|-----------------|--------|----------|----------|---------|-------|-------|-------|---|
| الأجرة | عدد أيام الحضور | الخميس | الأربعاء | الثلاثاء | الاثنين | الأحد | السبت | الاسم | ١ |
| | | | | | | | | حضرير | ٢ |
| | | | غ | | غ | | غ | باهرة | ٣ |
| | | | غ | | | غ | | جميله | ٤ |
| | | | | غ | | | | دريد | ٥ |



**University of Technology
Department of Applied Sciences
Final Examination 2014/2015**



Subject: Radioisotopes
Branch: Applied Physics
Examiner: Dr. Adi M. Abdul Hussien

Class: Fourth year
Time: 3 hr.
Date: / /2015

Note: Answer 6 questions only.

Q1) A) What is the basic principle of mass spectrometry? Then sketch the basic components of a mass spectrometer?

B) List and explain three of neutron source?

Q2) A) Find how much percentage of the intensity of gamma-ray beam passes through 7cm thicknesses of aluminum if the Half Value Layer for gamma-rays in Al is 3cm?

B) What are the biological effects of exposure to radiation? And explain why are children more affected by exposure to radiation than adults are?

Q3) A) Briefly defined the dose rate and the effective dose rate?

B) A lady has a dental X-ray which produces an absorbed dose of **0.3 mGy**. Calculate the equivalent dose of this X-ray .(The radiation weighting factor of X-ray is one)

Q4) A) Explain what is meant by the binding energy of a nucleus and Sketch a graph shows in it the binding energy per nucleon?

B) The mass of the nucleus of the isotope ${}^7_3\text{Li}$ is **7.016 u**. Find its binding energy in eV and nuclear radius R ? ($m_n = 1.008\ 66\text{u}$, $m_p = 1.007\ 276\ \text{u}$, $m_e = 0.00055\text{u}$ $1\ \text{u} = 1.66 \times 10^{-27}\ \text{kg}$, $(1\ \text{u})\ c^2 = 931.5\ \text{MeV}$)

Q5) A) What is the difference between (Alpha Particle), (Beta Particle) and γ ray?

B) State and explain the three common forms of Beta Decay?

Q6) Explain what is meant by the following and Write down an equation to represent.

A) The Mass Attenuation Coefficient. **B)** The specific ionization and the stopping power.

Q7) Number and explain the most important characteristics required in radiation scanning device?

Good luck



**University of Technology
Department of Applied Sciences
Final Examination 2014/2015**



**Subject : Ceramic
Branch : Applied Phys
Examiner : Dr.Salam Hussain AL Hadad**

**Class : 4th year
Time : 3 hours
Date :**

Q1\ Suggest the perfect mixture with temperature in formation Mullit from Al_2O_3 , SiO_2 phase diagrams .

Q2\ Answer only two

- A-What is phase transformation in silica? What is the effect of impurity on the transformations?
- B-Talking about main impurity materials in ceramic
- C-What do you think happens at fast drying temperature?

Q3\ In the drying processes just for wet Kaolin at drying temperature range between (150 – 220) $^{\circ}C$ sample lost its water contain in the range between 10 mm^3 to 100 mm^3 . What is the inner concentration of water if you know length path is (20mm), viscosity (1.2 pois). Density(1.6 g/ mm^3) ,surface concentration (3 g/ cm^3).

Q4\ Answer only two

- A-What is features of ceramic materials in:
- 1)Properties . 2) bonding
- B-Calculate Plastic Index for pantonite with water contain (0.30) and Plastic limit (0.6)
- C- What is the effective parameters on plasticity ?How could you explain plastic mechanism.

Q5\ Answer only three of below.

- A-Discuss the Micro and macro structure transformation due to sintering treatment.
- B- Classifying the main Group of clays by structure and Physical properties
- C-How many types of forming you have studied?



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Final Examination 2014/2015**



Subject : Ceramic

Class : 4th year

Branch : Applied Phys

Time : 3 hours

Examiner : Dr.Salam Hussain AL Hadad

Date :

D-How could you prevent crystal growth in sintering processes you should have to control some parameters : show that with figures.

**University of Technology
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Final Examination 2014/2015**



**Subject: NDT
Branch: Applied Physics
Examiner: D.Saryia Al-algawi**

**Class: 4th year
Time: 3 hours
Date 7-6-2015**

Answer five of the questions

Q1- Complete of the sentences: (14 marks)

- 1-Heat treatment techniques used to achieve a desired result such as-----
- 2- Dislocation is a crystallographic defect ----
- 3-Electrochemical corrosion is -----
- 4-Type of damage typically produces ----
- 5-The materials which have elastic constants differ with each direction are called----
- 6-Offset or mismatch is ----
- 7-Skin effect is the ---
- 8- Slag inclusions are ----
- 9- Pair production occurs when incident energy -----
- 10- The quality of a radiographic image can be described in terms of factors-----
- 11- The shear ultrasonic wave is-----

Q2- Give the Reason for the followings :(14 marks)

- 1-The anode is precisely angled at 1-20 degrees off perpendicular to the electron current?
- 2- Direct current (DC, full wave DC) Used to detect sub surface discontinuities where?
- 3-To help to prevent arcing, the prod tips should be?
- 4- Oxide inclusions are appearing as dark irregularly shaped discontinuities in the radiograph because?
- 5-Silver and gold are diamagnetic metals?
- 6-Ultrasonic testing technique is used to detect imperfections inside material?
- 7-To magnetize the part in two directions is important because?
- 8- An edge dislocation is occurring?
- 9-Ultrasonic waves are reflected at boundaries?
- 10-The reflected shear wave is reflected at a smaller angle than the reflected longitudinal wave within a given material, this is also due to the fact?
- 11- A magnetic field is produced due to?

Q3 define the expression with the diagram. (14 marks)

- 1- Interaction of X-rays with matter.
- 2- Dual element transducers.
- 3- Eddy Current Testing.
- 4-Creep (deformation).



Q4 Draw the diagrams for the following. (14 marks)

- 1-A cut away f a typical contact transducer
- 2-Incomplete penetration (IP).
- 3-Current passing through the conductor to magnetize the part in two directions to determine most of the defects.



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Final Examination 2014/2015



Subject: NDT
Branch: Applied Physics
Examiner: D.Saryia Al-algawi

Class: 4th year
Time: 3 hours
Date 7-6-2015

3-Current passing through the conductor to magnetize the part in two directions to determine most of the defects.

4-The comparison between conventional radiography and micro focus projection.

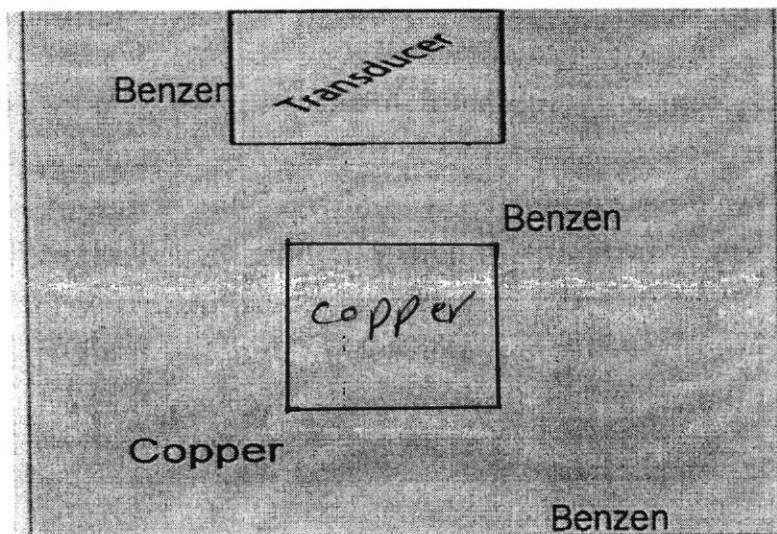
5- Screw dislocations

Q5- Calculate the magnitude of the geometrical unsharpness(image blur) and imaging distance from Object required to obtain an image magnified 40 times · when used X-ray source with focal spot (300μm)and Source to object distance (15mm) · and then drawing the diagram. **(14 marks)**

Q6- Calculate the reflection coefficient R and The transmission coefficient for Longitudinal Velocity bass from a Benzene interface and a Copper interface as shown in diagram. You may assume that the incident wave makes a zero degree angle with respect to the normal, that is, the direction of travel is perpendicular to the interface, in each case. And draw a diagram of the situation, showing incident waves from the transducer into the test specimen, which the amount of energy reflected and the amount of energy transmitted.

Where Longitudinal Velocity of Benzene is 0.130 cm/μs and the Density is .870 g/cm³

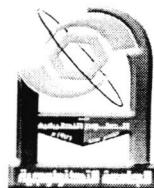
Where Longitudinal Velocity of Copper is 0.466 cm/μs and the Density is 8.93g/cm³. **(14 marks)**



Good Luck



*University of Technology
Department of Applied Sciences
Final Examination 2014/2015*



Subject : Spectroscopy .
Division : Applied Physics
Examiner : Prof Dr . Mohammad

year: ٤١
Time : 1.5 hours
Date : ١٦ . ٢٠١٥

Note: Answer only four questions(each of 15 marks)

- Q1- a)State factors effecting width of spectral lines, and explain one of them.
b) Calculate number of energy sublevels, energy spacing between them, and hence number of allowed spectral lines of the transition $S_{1/2} \rightarrow P_{3/2}$ under external magnetic field of 0.5 T.
- Q2- a)State regions of electromagnetic radiation in order from high to low energy.
b) Calculate wavenumbers of high and low edges of Paschen , and Brackett serieses ,then convert any wavenumber into ,1-wavelength(nm) ,2-energy(eV) ,3-energy(Jouls),and4-frequency(MHz).
- Q3- a)State all allowed electronic transitions of molecule,with a diagram showing regions of these transitions.
b)The fundamental and 1st overtone are centred at 1876 cm^{-1} ,and 3724 cm^{-1} respectively of $^{14}\text{N}^{16}\text{O}$,then calculate; 1-the wavenumber of equilibrium vibration. 2-the force constant. 3-the wavenumber of 4th overtone band,4-anharmonic constant, and 5-dissociation energy.
- Q4- a)state selection rules of an allowed electronic transition for atom.
b) If the rotational spectral lines are equally spaced by 7.26 cm^{-1} for $\text{C}^{12}\text{ O}^{16}$ molecule then ,calculate; 1)rotational constant. 2)bond length. 3)the most populated rotational level at temperature of 500K. 4)the wavenumber of most intensive spectral line at this temperature.

- Q5- a)State all spectroscopic processes of molecule,with a diagram.
b) If the rotational and distortion constants are 10.6 cm^{-1} and $5.3 \times 10^{-4}\text{ cm}^{-1}$ respectively of $^1\text{H}^{35}\text{Cl}$ then calculate,1)the wavenumber of J=4 rotational level.2)the wavenumber of absorption line starting from J=6.

Usefull constants:-

$$e = 1.6 \times 10^{-19} \text{ C}$$

$$C = 3 \times 10^{10} \text{ cm/s}$$

$$k = 1.38 \times 10^{-23} \text{ J/K}$$

$$\mu_B = 9.27 \times 10^{-24} \text{ J/T}$$

$$h = 6.62 \times 10^{-34} \text{ J.s}$$

$$m_u = 1.67 \times 10^{-27} \text{ Kg}$$

$$R = 1.0967 \times 10^5 \text{ cm}^{-1}$$

الموضوع: فزياء البلازما
المرحلة: الرابعة
الזמן: ثلاثة ساعات
التدريسي: د. صباح عبيب



2014-2015

جامعة التكنولوجية
قسم العلوم التطبيقية
فرع الفيزياء التطبيقية
الأمتحان النهائي/ الدور الأول

Answer Four questions only

Q1/A: Define only four:

1-Debye length 2-Pasma state 3- Larmor radius 4-mirror ratio 5-Langmuir probe. [12]

B/ Find the number of particles in Debye sphere for plasma with 10^{14} m^{-3} and electron temperature is 60 eV . [13]

Q2/ A/ Derive relationship between plasma frequency and Debye length. [13]

B/ Give the meaning of V_E with drawing.



[12]

Q3/ A/ Find the magnetic field required to confine plasma with density 10^{20} cm^{-3} and the temperature $KT_i = KT_e = 130 \text{ eV}$ if the $\beta = 0.1$. [13]

B/ Describe I-V characteristic for Langmuir probe? [12]

Q4/ (a) What is the saturation current density for plasma with density

10^{16} m^{-3} and temperature $2 \times 10^4 \text{ K}$

[13]

(b) Explain the display panel. [12]

Q5 / (A) Find the acceleration of gravity if the gravitational drift of electron is equal to drift due electric field (10 V/m). [13]

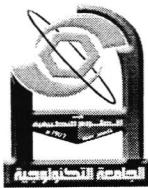
(B) Plasma with temperature 6 eV and density 10^{14} cm^{-3} . Find the density and the potential at $x = 30 \mu\text{m}$ when potential voltage is 4 V ?

[12]

$$e = 1.6 \times 10^{-19} \text{ C} \quad m_e = 9.1 \times 10^{-31} \text{ Kg} \quad m_p = 1.67 \times 10^{-27} \text{ Kg}$$

$$h = 6.62 \times 10^{-34} \text{ J/sec} \quad K = 1.38 \times 10^{-23} \text{ J/K} \quad \epsilon_0 = 8.85 \times 10^{-12} \text{ F/m}$$

$$\mu_0 = 4\pi \times 10^{-7} \text{ H/m} \quad g = 10 \text{ m/sec}^2$$



**University of Technology
Department of Applied Sciences
Final Examination 2014/2015**



**Subject: Solid state physics
Branch: Applied physics branch
Examiner: Dr. Selma M. Hussein**

**Class: 4 year
Time: 3 hours
Date: 24/5/2015**

Answer **only four** questions: 15 degree for any question

Q1. Draw and explain of the following.

1- Hall voltage with current. 2- Absorption coefficient with wavelength. 3- Drift velocity with electric field. 4- Fermi functions with temperature. 5- Thermal conductivity with temperature.

Q2.

- A. When that Ensinin model close from classical model? Prove that it mathematically.
- B. Defined the following?
 - 1- Agure recombination process. 2- BCS theory for superconductivity. 3- Photo detector.
 - 4- Direct energy gap. 5- Depletion layer.

Q3.

- A. Semiconductor sample doped with impurity have ionization energy $E_d = 0.05$ eV and doping concentration $N_d = 10^{17}$ cm⁻³. Calculate electrical conductivity if $\mu_e = 1500$ cm²/V.sec, $\mu_h = 500$ cm²/V.sec, and $N_c = 3 \times 10^{19}$ cm⁻³, also calculate Fermi level at 200K.
- B. Explain experimentally can be calculate specific heat for electron.

Q4.

- A. State absorption process for semiconductor and explain the process occur when $h\nu > E_d$ or E_a .
- B. Compare between Lorenz number for Drude model and Summerfield model.
- C. Explain photo emission for electron.

Q5.

- A. For diatomic crystal with $m = 1 \times 10^{-27}$ Kg and $M = 5 \times 10^{-27}$ Kg . Find the phonon frequency at a) minimum optical mode. b) maximum acoustic mode. If $\alpha = 0.4$ N/ m.
- B. Drive the following?
 - 1) Density of state in one dimension.
 - 2) Derive reduced mass for electron.

$$e = 1.6 \times 10^{-19} \text{ C, and } k_B = 1.38 \times 10^{-23} \text{ J/K.}$$

Good luck