1- عند ثبوت درجة حرارة غاز ذو كتلة معينة ثابتة يمكن تغيير ضغطه مع بقاء ..... إلا إن ذلك لا يتم عمليا دون تغيير ..... الذي يشغله الغاز.

2- الطاقة الكهربائية المصروفة تساوي .....و الطاقة الحرارية للتسخين تساوي.....

3- في تجربة محرار المقاومة القراءات لم تتغير , هذه دليل على ان المحرار في ..... مع الماء المغلي

4- ان فائدة المسعر في تجربة المزج .....

5- الإشعاعية و الامتصاصية هاتان الكميتان تتغيران بصورة عامة مع ..... (7 درجة)

مع تمنياتي لكم بالنجاح

أ.م.د. موفق فاضل صبرع
رئيس قسم الفيزياء

م.د. عدي سلمان مهدي
مدرس المادة

وزارة التعليم العالي والبحث العلمي
جامعة المثنى
كلية العلوم
قسم الفيزياء

المرحلة : الثالثة
المادة : الاغشية الرقيقة
الوقت : 3 ساعات
التاريخ : 2024/6/30

44

((أسئلة الامتحانات النهائية\ الفصل الدراسي الأول\ السنة الدراسية 2023 -2024))

س1/أ:- عبر رياضياً عن كل مما يأتي؟ (6 درجة)
1. التوصيلية البصرية . ، 2. Optical Interference Method .، 3. طاقات التنشيط الحراري .

ب:- ماهي انماط تشغيل AFM؟ وعلى ما تعتمد ؟ (4 درجة)

س2/أ:- ما اوجهه الشبه والاختلاف بين (Elastic Scattering) &(Inelastic Scattering)؟(6 درجة)

ب:- ماهي المعلومات التي يمكن الحصول عليها من خلال نمط تداخل ملون عندما ينعكس الضوء من الحدود العليا والسفلى لغشاء نفط رقيق. (4 درجة)

س3/أ:- اعطي تفسيراً علميا لكل مما يأتي؟ (7 درجة)
1. تصنف المواد الصلبة من حيث قابليتها للتوصيل الكهربائي إلى ثلاثة أنواع رئيسية.
2. طريقة خلق العيوب بواسطة التشويب تعد من أكثر الطرق القابلة للتطبيق.
3. استبدال بعض المعادن بالبوليمرات في العديد من الاستخدامات .
4. لقد أثبتت طريقة ترسيب الحمام الكيميائي لإعداد الأغشية الرقيقة أنها تقنية جذابة.
5. من المزايا والايجابيات التي يمكن تحقيقها من استعمال الليزر في تحضير الاغشية الرقيقة هي جعل مصدر الليزر خارج حجرة التبخير.
6. مواد الأغشية الرقيقة هي العناصر الرئيسية للتقدم التكنولوجي المستمر.
7. لكي يحدث الليزر تأثيراً في المادة يجب أن يكون هناك امتصاص لشعاع الليزر.

ب:- ماهي المراحل التي تمر بها عمليات PVD ؟ (3 درجة)

س4/أ:- عدد طرق الترسيب ضمن تقنية (Sputtering) (6 درجة)

ب:- ما الذي يمثله التيار الكهروكيميائي الضوئي والكهربائية المتولدة المتوهجة؟ (4 درجة)

س5/أ:- عدد التطبيقات التي يمكن الاستفادة منها في انماء الاغشية الرقيقة بطريقة Mechanism of Pulsed-Laser Deposition ؟(5 درجة)

ب:- ما الميزة الأساسية التي تتمتع بها تقنية التبخير الحراري بالليزر؟ (5 درجة)

س6/أ:- عرف ما يأتي (6 درجة)
1. AFM ، 2. Ellipsometry . ، 3. SEM ، 4.Data Storage ، 5. Ion Plating ، 6. XRD

ب:- كيف يمكن الحصول على طبقة او اكثر من طبقة من الذرات المترسبة بطريقة Sputtering؟ (4 درجة)

تمنياتي لكم بالنجاح

Ministry of Higher Education
& Scientific Research
Muthanna University
College of Science
Department of Physics

Subject: Electromagnetism
Stage: 4th stage

Date: 30/6/2023
Time:

30 JUN 2024

((Assessment of the final exam for the first semester))
Academic year 2023-2024

45

Q1// A charge distribution with spherical symmetry has density: $\rho_v = \begin{cases} \frac{2\rho_o^2}{R} , & 0 \le r \le R \\ 0 , & r > R \end{cases}$,

Determine the electric intensity E and potential electric V everywhere ? (10 mark)

Q2// Determine electric flux D at (4 , 0, 3) if there is a point charge (-5 π)mC at (4,0,0) and a line charge (3π) mC/m along the Y-axis, then find the electrical intensity ? (10 mark)

Q3// The point charges (-1 nC) , (4 nC),and (3 nC) are located at (0,0,0) , (0,0,1) , and (1,0,0), respectively find the energy in the system?

Let a vector field $A = A_x\, a_x + A_y a_y + A_z\, a_z$, that is $\nabla . \nabla \times A = 0$? ? (10 mark)

Q4// The finite sheet $0 \le x \le 1$, $0 \le y \le 1$ on the Z=0 , plane has a charge density : $\rho_s = xy\,(x^2 + y^2 + 25)^{3/2}\ nC/m^2$, find :

1- The total charge on the sheet ?
2- The electric field at (0 ,0 , 5)?
3- The force experienced by a (-1 mC) charge located at (0 , 0 , 5)? (10 mark)

Q5// If vector field $F = 2\rho z\, a_\rho + 3z \sin\varphi\, a_\varphi - 4\rho \cos\varphi a_z$, Verify Stokes's theorem for the open surface defined by Z=1 , $0 < \rho < 2$, $0 < \varphi < \frac{\pi}{4}$? (10 mark)

Q6 // Answer only one branch: (10 mark)

1- Let a vector field $A = A_x\, a_x + A_y a_y + A_z\, a_z$, that is $\nabla . \nabla \times A = 0$?
2- Show that the vector fields

$$A = \rho^2 \sin\varphi\, a_\rho + \rho^2 \cos\varphi\, a_\varphi + \rho^2\, a_z$$
$$B = \rho^2 \sin\varphi\, a_\rho + \rho^2 \cos\varphi\, a_\varphi - \rho^2\, a_z$$

Are perpendicular to each other at any point ?

Best of luck to you

Lecturer
Alaa Hassim mohammed

Head of department

Ministry of Higher Education & Scientific Research
Al-Muthanna University
College of Science
Department of Physics

Subject: Electricity
Stage: First
Date: 30/6/2024
Time: 3 Hours

30 JUN 2024

45

((Assessment of the final exam for the first semester))
Academic year 2023-2024

Q1// Choose correct answer for the following: (7 Marks)

1) The masses of a proton and neutron are nearly equal, and the mass of each is about _____ times are greater than electron. **(a)** 1490 **(b)** 1480 **(c)** 1840 **(d)** 1940
2) If the charge is distribution over a surface, we define the surface charge density _____.
(a) λ **(b)** σ **(c)** ρ **(d)** α
3) The flux has a maximum value when the surface is _____ to the field.
(a) opposite **(b)** equal **(c)** parallel **(d)** perpendicular
4) If the electric field lines associated with a positive charge +2q and a negative charge -q in this case, the number of lines leaving is _____ the number of line terminating.
(a) half of **(b)** equal to **(c)** twice of **(d)** triple of
5) If the voltage to a light bulb is 120 V and the resistance of the filament is 240 Ω, how much current does the bulb use? **(a)** 0.5 A **(b)** 2 A **(c)** 360 A **(d)** 28800 A
6) Determine the electric flux for a Gaussian surface that contains 100 million electrons.
(a) $180\ N\ m^2/C$ **(b)** $18\ N\ m^2/C$ **(c)** $1.08\ N\ m^2/C$ **(d)** $1.8\ N\ m^2/C$
7) Find the electric field at a distance 1cm from a positive point charge of magnitude $q = 10^{-10}\ C$. **(a)** 90 N/C **(b)** 900 N/C **(c)** 9000 N/C **(d)** 90000 N/C

Q2// Answer TRUE or FALSE for the following: (7 Marks)

1) One gram-mole of monatomic hydrogen consists of 6.02×10^{23} particles and that it mass is 1.008gm, the mass of protons and neutrons are equal.
2) A body having not equal amounts of positive and negative charges (i.e. non zero net charge) is called electrically neutral.
3) The force on a negative test charge is in the same direction as the electric field at the point.
4) The flux is positive if more lines are leaving than entering the surface.
5) The electric potential V is positive or negative depend on the sign of the distance r.
6) The Gaussian surface should have the same symmetry as that of the charge distribution
7) For resistances connected in parallel, the Voltage in each branch is the same as the supply voltage therefore the more bulbs added the dimmer each one is.

Q3// Solve the following: (7 Marks)

a// Coulomb's law for two point charges. A point charge, q1 =2 μC is placed 0.5m from another point charge q2= -5μC. Calculate the magnitude and direction of the force on each charge.

b// An infinitely long line of charge carries 0.4 C along each meter of length. Find the E-field 0.3 m from the line of charge.

وزارة التعليم العالي والبحث العلمي
جامعة المثنى
كلية العلوم
قسم الفيزياء

المرحلة : الثالثة
المادة : حزمة برامج ماتلاب
الوقت :
التاريخ : 2024/7/10

44

((أسئلة الامتحانات النهائية\ الفصل الدراسي الأول\ السنة الدراسية 2023 -2024))

الجزء العملي

س1//
اكتب برنامج يعمل على ايجاد حل المعادلة: $ax^2+bx+c=0$ لأي قيمة ل a,b,c ، بعد التحقق من وجود حل للمعادلة في مجال الاعداد الحقيقة (5 درجات)

س2//
اكتب برنامج بلغة ماتلاب لرسم دالتي $e^{\sqrt{x}}$ و $\cos(\pi x^2)$ في شكل بياني واحد مع اضافة اسم للشكل البياني واسماء للمحاور وتسمية توضيحية للدلالة على كل منحني، علما ان ($-10 \leq x \leq 10$) (5 درجة)

س3//
اكتب برنامج لجمع الاعداد التي تقبل القسمة على 3 من 50 ولغاية 150 (5 درجات)

س4//
لديك المصفوفتين: $A=\begin{bmatrix}1&2&3\\3&2&4\\2&0&2\end{bmatrix}, B=\begin{bmatrix}2&1&1\\2&4&6\\1&2&3\end{bmatrix}$ (5 درجات)

جد الآتي مستخدما MATLAB:
1. مربع كل عنصر في A
2. جذر كل عنصر في B
3. الضرب النقطي للمصفوفتين
4. الضرب الاتجاهي للمصفوفتين
5. أنشئ مصفوفة صفرية ابعادها تتغير تبعا لابعاد المصفوفة B

تمنياتي لكم بالنجاح

كلية العلوم
قسم علوم الفيزياء
اللجنة الامتحانية
الصباحية

رئيس القسم
أ.م.د موفق فاضل جدوع

أستاذ المادة
م.د علي ناظم صبار

وزارة التعليم العالي والبحث العلمي
جامعة المثنى
كلية العلوم
قسم الفيزياء

01 JUL 2024

اسئلة الامتحانات النهائية الكورس الاول
للعام الدراسي 2023-2024

44

المرحلة/ الثانية
المادة/ ميكانيك تحليلي I
الزمن/ 3 h
التاريخ / ١ / ٧ / 2024

01 JUL 2024

ملاحظة/ الاجابة على جميع المسائل.

س1/

a) اشتق معادلة التعجيل في الاحداثيات القطبية وبين كل جزء من المعادلة ماذا يمثل. (8 درجة)

b) اذا علمت ان متجه الازاحة لجسيم م هو $\mathbf{r}= (2t^2-5t)i+(4t+2)j+t^3k$ جد المسافه والانطلاق والتعجيل. (7 درجة)

س2/

a) متذبذب توافقي مضمحل كتلتة m=10kg و k=250N/m و c=60kg/s اذا علمت ان التردد الرنيني يساوي $2.64\ sec^{-1}$ جد زاوية الطور. (8 درجة)

b) جد عزم القصور الذاتي لسلك رفيع طوله a و كتلته m من مركز الدوران. (7 درجة)

س3 / اجب عن احد الفرعين:

a) جد معادلة المدار التفاضلية لجسيم يتحرك تحت تاثير قوة مركزية لدالة قطبية F(r) للحصول على r وθ كدوال للزمن t علما ان $a_r = \ddot{r} - r\dot{\theta}^2$ و $a_\theta = r\ddot{\theta} + 2\dot{r}\dot{\theta}$. (15 درجة)

b) اشتق معادلة حركة جسيم متغير الكتلة. (15 درجة)

س4/

a) جسم يتحرك في مسار خلزوني بمحاور اسطوانية تتغير مع الزمن ب $R=A$ و $\phi=Bt^2$ و $Z=Ct^2$ حيث ان A و B و C ثوابت .جد متجهات السرعة والتعجيل كدوال للزمن. (8 درجة)

b) اشتق معادلة العزم الدوراني لجسم صلد حول محور ثابت. (7 درجة)

مع تمنياتي لكم بالنجاح

رئيس قسم الفيزياء

م.د. عدي سلمان مهدي

Ministry of Higher Education
&Scientific Research
Al-Muthanna University
Faculty of Science
Physics Department

45

Class / 3rd
Subject / Quantum Mechanics I
Time / 3 hours
Date: -26/06/2024

The Final Examination for the First Semester 2023-2024

20 JUN 2024

Q1 / A steady beam of particles with energy $E > V_o$ is incident on a potential step of height V_o. The wave functions in the two regions are given by

$$\psi_1(x) = A_1 \exp(ik_1 x) + B_1 \exp(-ik_1 x)$$
$$\psi_2(x) = A_2 \exp(ik_2 x) + B_2 \exp(-ik_2 x)$$

If $E = \frac{5}{3}V_o$, evaluate the reflection and transmission coefficients. **(15 Marks)**

Q2 / Evaluate the normalization factor D of the following wave function $\psi(x) = \frac{D}{x^2 + a^2}$ **(10 Mark)**

Q3. Prove that $\exp(ip_x\alpha/\hbar)\hat{x}\exp(-ip_x\alpha/\hbar) = \hat{x} - \alpha$; **where** $\psi(x,t) = A\exp i(p_x x - Et)/\hbar$. **(10 Mark)**

Q4 / Answer on the following:

1. Obtain the energy Eigen value for particle in a box describing by the wave function $\psi(x) = A\cos\frac{4\pi x}{a}$.
2. If the wave function is written as $\psi(x,t) = Ae^{i(kx-wt)}$, evaluate $< E >$. **(15 Marks)**

Q5 / Answer on the following questions by a word : True or False

1. The full Schrödinger equation in compact form is : $H\psi = i\hbar\frac{\partial\psi}{\partial x}$
2. The time-independent Schrödinger equation is obtained from the full Schrödinger equation by separation of the x and y variables.
3. The wave function of a particle in a box is given by: $\psi(x) = A\sin(kx) + B\cos(kx)$.
4. Schrödinger wave equation can be derived from "Principles of Quantum Mechanics".
5. The three-dimensional time-independent Schrödinger equation of a particle moving in a cubic box is , $\nabla^2\psi + k^2\psi = 0$.

(10 Marks)

Best of Luck

Prof. Hadey K. Mohamad

Asst. Prof.Dr. Muwafaq Fadhil

Ministry of Higher Education & Scientific Research
Al-Muthanna University
College of sciences
Department Of Physics

Subject: Calculus I
Stage :First
Date: 26/6/2024
Time: 3 Hours

2 3 JUN 2024

((Assessment of the final exam for the first semester))

45

Academic year 2023-2024

Q1: (i) Find the Domain and Range of the given functions : **[15 Marks]**

a) $f(x) = \sqrt{x^2 + 5x + 6}$ b) $f(x) = \frac{2}{x^2-16}$

(ii)Find the inverse of the following function: $f:[2,\infty) \to [0,\infty)$; $f(x)=x^2 - 4x + 4$.

Then Sketch its.

(iii) Given that $f(x) = (5 - a)x^2 + (b + 2)x - 3$ is a constant function. Find a & b.

Q2: (i) Let $f: R \to R$ such that f(x) is continuous for all real values of x

$$f(x) = \begin{cases} 2ax + 4 \ \ if \ \ x > 3 \\ x - 5 \ \ if \ x = 3 \\ bx + a \ \ if \ \ x < 3 \end{cases}$$. Find the value of a and b .

(ii) Calculate the given limits : [choose 2 only]

$\lim_{x\to 0} \frac{(x^2+2x)}{sin2x}$; $\lim_{x\to\infty} \frac{3^x}{x^3}$; $\lim_{x\to 0} x^2 \, cos \, \frac{1}{x}$. **[10 Marks]**

Q3: (i) If $\sinh x = \frac{-2}{5}$. Calculate the other five hyperbolic functions. **[15 Marks]**

(ii) Let $f(x) = x^2$. *Find two function $g(x)$ such that*

$$(f \bullet g)(x) = f(g(x)) = x^2 - 10x + 25 .$$

(iii) Let $y = cotx$. *Find D_f, R_f ; then skect its.*

Q4: Find $\frac{dy}{dx}$ of the following : **[10 Marks]**

(i) $x^2y = \sin^{-1} x + \cos 2x$; (ii) $y=x^2 \cos^{-1}(1 - x) + \cosh(x^2)$;

(iii) $y= (sinx)^x + e^{x^3} + 5$. : (iv) $x^2 cosy + 2y^2x = 7$.

M. M. KRADY
Lecturer
Assist prof. Mousa M. Krady

Head of department

Ministry of Higher Education
& Scientific Research
Al Muthanna University
College of Science
Department of physics

Subject: Solid state physics I
Stage: fourth

Date: 26 / 6 /2023
Time: 3 hours

((Final exam for the first semester))
2023 -2024

45

Q1. Answer the following questions

(a): What is the physical meaning of the primitive unit cell and non – primitive unit cell? (5 Marks)

(b): Determine the type of unit cells and their properties. (5 Marks)

Q2. (a): Find the angle between any two adjacent edges of the rhombohedral primitive cell of the Face- centered cubic(FCC) lattice. (5 Marks)

(b): show that the reciprocal lattice vector $G(hkl)$ is normal to crystal plane (hkl). (5 Marks)

Q3. (a): Write diffraction condition in reciprocal lattice, and prove it is just the Bragg diffraction low. (5 Marks)

(b): Prove that the equation of motion (dispersion relation) in diatomic linear series is reduced to propagation relation of an elastic sound wave travel in continuous media, at the value of the wave vector (k) is very small. (5 Marks)

Q4:- By using the general reciprocal lattice vector $G(hkl)$,drive a relationship between $d_{hk\ell}$ and direct primitive translation vectors of the (BCC) lattice. (10 Marks)

Q5. (a): Find the phase velocity and the group velocity at very small and large values of the wave vector (k) for monatomic linear series (8 Marks)

(b): X-ray radiation is incident in the cubic crystal lattice plan (242), if the distance between two adjacent parallel planes $d_{111} = 3\times10^{-10}\,m$, and the energy of the incident radiation is $40KeV$, find the angle of the second order scattering. (4Marks)

Q6: from studying the dispersion relation of diatomic linear series Answer the following questions (8 Marks)

1- We get curve with two branches, what are these two branches?
2- What we called the region that separate these two branches?
3- The width of the region that separate these two branches depends on what?
4- When these two branches are contact?

Best of luck

Not: $h = 6.626\times10^{-34}\,J.\sec$, $1eV = 1.6022\times10^{-19}\,J$

Lecturer

Ministry of Higher Education & Scientific Research
Al-Muthanna University
College of sciences
Department Of Physics

Subject: Calculus I
Stage :First
Date: 26/6/2024
Time: 3 Hours

20 JUN 2024

((Assessment of the final exam for the first semester))

Academic year 2023-2024

45

Q1: (i) Find the Domain and Range of the given functions : [15 Marks]

a) $f(x) = \sqrt{x^2 + 5x + 6}$ b) $f(x) = \frac{2}{x^2-16}$

(ii)Find the inverse of the following function: $f:[2,\infty) \to [0,\infty)$; $f(x)=x^2 - 4x + 4$.

Then Sketch its.

(iii) Given that $f(x) = (5 - a)x^2 + (b + 2)x - 3$ is a constant function. Find a & b.

Q2: (i) Let $f: R \to R$ such that f(x) is continuous for all real values of x

$$f(x) = \begin{cases} 2ax + 4 \ \ if \ \ x > 3 \\ x - 5 \ \ if \ x = 3 \\ bx + a \ \ if \ \ x < 3 \end{cases}$$. Find the value of a and b .

(ii) Calculate the given limits : [choose 2 only]

$\lim_{x\to 0} \frac{(x^2+2x)}{sin2x}$; $\lim_{x\to \infty} \frac{3^x}{x^3}$; $\lim_{x\to 0} x^2 \cos \frac{1}{x}$. [15 Marks]

Q3: (i) If $\sinh x = \frac{-2}{5}$. Calculate the other five hyperbolic functions. [15 Marks]

(ii) Let $f(x) = x^2$. *Find two function* $g(x)$ *such that*

$(f \bullet g)(x) = f(g(x)) = x^2 - 10x + 25$.

(iii) Let $y = cotx$. *Find* D_f , R_f ; *then skect its.*

Q4: Find $\frac{dy}{dx}$ of the following : [choose 3 only] [15 Marks]

(i) $x^2y = \sin^{-1} x + \cos 2x$; (ii) $y=x^2 \cos^{-1}(1 - x) + \cosh(x^2)$;

(iii) $y= (sinx)^x + e^{x^3} + 5$ (iv) $x^2 cosy + 2y^2x = 7$.

M-M-KRAY
Lecturer

Head of department

وزارة التعليم العالي والبحث العلمي
جامعة المثنى
كلية العلوم
قسم الفيزياء

المرحلة : الرابعة
المادة : الفيزياء النووية 1
الوقت : 3 ساعات
التاريخ : 29/6/2024
29 JUN 2024

44

((أسئلة الامتحانات النهائية\ الفصل الدراسي الأول\ السنة الدراسية 2023 -2024))

س1\ احسب قدرة الايقاف للبروتون الساقط على وسط مملوء بغاز الاوكسجين $^{16}_{8}O$ بسرعة 0.5c علما ان كثافة الاوكسجين $1.429\times10^{-3}\,g/cm^3$، كم ستكون الطاقة الضائعة لوحدة الطول لو كانت الجسيمة المشحونة الفا؟ (10 درجة)

س2\ احسب كتلة نواة ذرة الهيليوم $^{4}_{2}He$ وفقا لمعادلة وايزكر Weizcher formula علما ان: (10 درجة)

a_v	a_s	a_c	a_a	δ	T_{sh}
14	13	0.6	19	$34/A^{3/4}$	3

س3\ مصدر يطلق اشعة كاما شدتها الابتدائية $10KW.Sr^{-1}$ وضع امامه صفيحة من معدن سمكها $8cm$ ماقيمة شدة الاشعة النافذة، لوكان سمك النصف للمعدن $x_{1/2}=3cm$ ؟ (10 درجة)

س4\ وفقا لنموذج القشرة النووي حدد الزخم الزاوي والتماثل للانوية التالية: $^{9}_{4}Be,\ ^{19}_{9}F,\ ^{40}_{20}Ca$ (10 درجة)

س5\ عدد خصائص القوة النووية (10 درجة)

س6\ املأ الفراغات التالية بما يناسبها: (10 درجة)

1. النظائر هي..... اما الايزوبارات .....
2. الفيرمي يعادل ..... من المتر اما البارن يعادل .....
3. في ظاهرة التأثير الكهروضوئي تمتص طاقة الفوتون من قبل الذرة وينفصل عنها .....
4. ان ظاهرة التأثير الكهروضوئي تسود ضمن طاقات الفوتون الواطئة وللمواد ذي الاعداد الذرية .....
5. عند اتحاد الكترون وبوزوترون تخرج اشعة كاما في عملية تدعى .....

Note: $N_A=6.022\times10^{23}\,atom/mol$, $e=4.8\times10^{-10}\,esu$, $R_o=1.2F$
$M_n=1.008665\,u, M_p=1.007286\,u, M_e=0.0005486\,u$

تمنياتي لكم بالنجاح

Ministry of Higher Education
& Scientific Research
Al Muthanna University
College of Science

((Final Exam/2nd Semester))
2023-2024

Subject: Mechanics and Properties of Materials II
Stage: The first
Date: 29/6/2024
Time: 3 hours

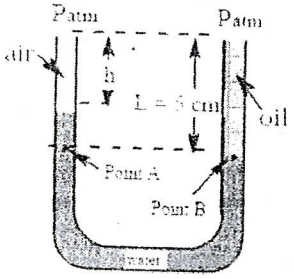
29 JUN 2024

45

Note: Answer only five questions

Q1: Explain the concept of surface tension **(7 Mark)**

Q2: Placing oil above water in a U-shaped tube leads to the displacement of air to the other side, as in the figure below. Find the height of the air column, h, and if the air passes over the left tube, what is its velocity, knowing that the density of the air is $\rho_a = 1.29\ kg/m^3$ and the density of the oil is $\rho_o = 750\ kg/m^3$?



(7 Mark)

Q3: Derive a mathematical expression for the Navier and Stokes equation **(7 Mark)**

Q4: If the velocity of an incompressible fluid is $\vec{v} = 2xy\hat{\imath} - x^2y\hat{\jmath}$ Is this flow real (physical)? Explain that **(7 Mark)**

Q5: Derive a mathematical expression for Bernoulli's equation **(7 Mark)**

Lecturer
Bashar.Hawi. Azeez

Assist. Prof.Dr. Muwafaq Fadhil
Head of Department

Ministry of Higher Education
& Scientific Research
Al Muthanna University
College of Science

((Final Exam/ 2nd Semester))
2023-2024

Subject: Mechanics and
Properties of Materials II
Stage: The first
Date: 27/6/2023
Time: 3 hours

29 JUN 2023

45

Q6: A fluid of viscosity (η) and density (ρ) flows between two parallel plates, the distance between them ($2h$) under the influence of gravity, downward. If the fluid is entirely determined by the velocity ($v_z = v_z(x)$). Use the Navier-Stokes equation to find this velocity? **(7 Mark)**

Lecturer
Bashar.Hawi. Azeez

Assist. Prof.Dr. Muwafaq Fad
Head of Department

Ministry of Higher Education
& Scientific Research
AL Muthanna University
College of Science
Department of Physics

Subject: English Language IV
Stage: Fourth Stage
Date: / /2023
Time: 3 hours

(Final Exam for the First Semester)
2023 -2024

01 JUL 2023

45

Q1: Read the following article carefully and answer the questions below: **(12 marks)**

TODAY'S COMMUNICATION in 2050

People have always been involved in technology to develop. As a result, the contribution of technology to the modern world is undeniable. It is obvious that the most significant development has been in communication. Today people benefit from different means of communication a great deal. It can be clearly predicted that there will be a lot of new inventions in 2050 and with the help of them, people will have more opportunities to communicate with others. Although some tools of conversation like mobile phones and laptops will keep their popularity in daily life, the Internet and home-telephones will be much more different in 2050.

One obvious similarity in communication will probably be the popularity of mobile-phones and laptops. Today they are very popular and widely used because of their price and mobility. In the future, people will still be using them in daily life as they will be cheaper and more common. To give an example, today most young people are the real users of mobile phones and laptops. Since they have already been familiar to them, in 2050 they will have been addicted to these small devices while communicating with whoever they like.

On the other hand, the first magnificent difference in communication will be the advanced use of the Internet. Even though it is used worldwide now, technological changes will make the Internet develop considerably. For example, it will enable people to go on day-trips or holidays to faraway places even to other planets by virtual reality. Today the Internet is still popular in education. However, as it is going to be much faster and cheaper, students will get more benefit from the Internet in class environment and communicate with teachers and students all over the world by video-conferencing.

The second impressive novelty in communication will be the different use of home telephones. Nowadays, they are mostly used to have conversations, but in 2050 people will not only be talking to and seeing each other but also doing their jobs at the same time in their houses using their home telephones. As an example, a businessman will be able to run his business and make deals with other companies using his audio-visual home telephone without having to go to his office.

To summarize, it seems that communication in 2050 will be similar to that of today in terms of mobile phones and laptops. Unlike this, there will be remarkable differences in the use of the Internet and home telephones thanks to developing technology. To me, while mankind keeps improving himself, changes in communication depending on technology is inevitable.

1- Paraphrase the following sentence
"It can be clearly predicted that there will be a lot of new inventions in 2050 and with the help of them, people will have more opportunities to communicate with others."
2- Extract the comparison and/or contracting expressions.
3- Find the compound nouns from this passage.
4- Find the compound adjectives from this passage.

Assist Prof. Dr. Rasha A. Hussein
Instructor

Assist. Prof. Dr. Muwafaq Fadhil Jaddoa
Head of Department

Ministry of Higher Education
& Scientific Research
AL Muthanna University
College of Science
Department of Physics

Subject: English Language IV
Stage: Fourth Stage
Date: / /2023
Time: 3 hours

(Final Exam for the First Semester)
2023 -2024

45

Q2: Fill in the gaps in the text with words from the list **(10 Marks)**

despite their	even though	as a result	despite the	due

...1... it was cold outside, the youngsters continued to play in the park. They wore thick coats and gloves ...2... of the cold. Because they didn't want a chilly neck, one wore a large scarf. ...3... chilly wind, they had a good time. They were exhausted when they returned home ...4... of their play. ...5... earlier exertions, they were still full of energy! They got together again later that day to go ice skating. They had to take two buses to get to the ice rink.

Q3: Replace the underlined words with the compound adjectives: **(15 Marks)**

1. She is a famous poet.
2. My sister, who is two years old, is very naughty.
3. A walk of about five kilometers may be very exhausting.
4. The Browns have bought a used car.
5. My dress costs fifty dollars.

Q4: Answer the following

(13 Marks)

I. Check the right explanation for the following statements.

1- A- I used the camera all the week. But yesterday it didn't work.

B- It must have run out of charge.

a. I am almost certain that it has run out of charge. b. It's possible that the camera has run out of charge.

2- The book was here a minute ago. Someone might have taken it.

a. I am saying that it is possible that someone took it. b. It can't be true that someone took it.

c. I am sure that some has come and taken it.

3- Oh my god! The car is crushed. A terrible accident must have happened.

a. I am guessing that the accident happened. b. It's a possible explanation why the car is crushed

c. It's for sure the car had an accident.

4- You had just travelled when you called me .you couldn't have been there.

Where were you calling from?

a. It's possible that he arrived. b. No way he was there it is not possible c. I am sure he was there.

Assist Prof. Dr. Rasha A. Hussein
Instructor

Assist. Prof. Dr. Muwafaq Fadhil Jaddoa
Head of Department

Ministry of Higher Education
& Scientific Research
AL Muthanna University
College of Science
Department of Physics

Subject: English Language IV
Stage: Fourth Stage
Date: / /2023
Time: 3 hours

01 JUL 2024

(Final Exam for the First Semester)
2023 -2024

45

5- The ground is still wet. It could have rained here a couple of hours ago.
a. I am sure that it rained. b. No way had it rained. c. It's possible that it rained.

II. Match the words to their (near Synonyms)

1. Scheme	a. Factories
2. Population	b. Business
3. Agriculture	c. City planning
4. Commerce	d. Farming
5. Employment	e. Jobs
6. Household waste	f. Inhabitants
7. Industry	g. Plan
8. Urban design	h. rubbish

Q5: Do as required

(10 Marks)

1. We were late. However, we decided to walk. (Despite)
2. The_____in weather between my country and that in the United Kingdom is very noticeable.
   a. Compare b. contrast c. comparison
3. She said she didn't want to change her job. She may change her mind. (In spite of)
4. In my country, people eat to live, _____ in the United Kingdom people live to eat.
   a. Whereas b. where c. therefore
5. I find it difficult to _____ between British English and American English
   a. distinctive b- distinguish c- distinction

BEST OF LUCK

Assist Prof. Dr. Rasha A. Hussein
Instructor

Assist. Prof. Dr. Muwafaq Fadhil Jaddoa
Head of Department

Ministry of Higher Education
& Scientific Research
Al Muthanna University
College of Science
Department of physics

Subject: Solid state physics I
Stage: fourth

Date: 4 / 1 /2024
Time : 3 hours

((Final exam for the first semester))
2023 -2024

45

Q1. **Answer the following question**

(a): What is the physical meaning of Brillouin zones? **(5 Marks)**

(b): A conventional unit cell may be chosen usually, why, give an example of the conventional unit cell **(5 Marks)**

Q2. **(a): Find the distance between two adjacent parallel planes of the Orthorhombic primitive cell** ($a = 2A^o, b = 1A^o, c = 3A^o$) **which have the vectors** $[2\,1\,\bar{1}]$ **and** $[2\,1\,0]$ **normal to the plane** $(hk\ell)$. **(5 Marks)**

(b): Find the angle between any two adjacent edges of the rhombohedron primitive cell of (BCC) lattice. **(5 Marks)**

Q3. **Prove that the reciprocal of the reciprocal lattice to the simple hexagonal lattice is direct lattice.** **(10 Marks)**

Q4. **By using the general reciprocal lattice vector** $G(hkl)$ **,drive a relationship between** $d_{hk\ell}$ **and direct primitive translation vectors of the Monoclinic** ($a \neq b \neq c, \quad \alpha = \gamma = \pi/2 \neq \beta$)**lattice** **(10 Marks)**

Q5. **Define the following:** **(8 Marks)**

(1). dispersion relation. (2). phase velocity. (3). group velocity. (4). cutoff frequency.

Q6. (a): **Find the phase velocity** (V_{ph}) **and the group velocity** (V_g) **at very small and large values of wave vector (k) for acoustical branch of diatomic linear series.** **(8 Marks)**

(b): Monatomic linear series with inter atomic space $a = 3\times10^{-10} m$ **and the mass of atom is** $3.8\times10^{-23} gm$, **if the sound velocity equal to** $V_0 = 3\times10^{10} m/\sec$.**Calculate the cutoff frequency** ($\omega_{\max}$) **and force constant** (μ). **(4 Marks)**

Best of luck

Lecturer
Salah. A. H. Almurshidee

Head of Department

Ministry of Higher Education
& Scientific Research
Al Muthanna University
College of Science
Department of physics

Subject: Solid state physics I
Stage: fourth

Date: 4 / 1 /2024
Time : 3 hours

((Final exam for the first semester))
2023 -2024

45

Q1. Answer the following question

(a): What is the physical meaning of Brillouin zones? (5 Marks)

(b): A conventional unit cell may be chosen usually, why, give an example of the conventional unit cell (5 Marks)

Q2. (a): Find the distance between two adjacent parallel planes of the Orthorhombic primitive cell ($a = 2A^o, b = 1A^o, c = 3A^o$) which have the vectors $[2\bar{1}1]$ and $[210]$ normal to the plane $(hk\ell)$. (5 Marks)

(b): Find the angle between any two adjacent edges of the rhombohedron primitive cell of (BCC) lattice. (5 Marks)

Q3. Prove that the reciprocal of the reciprocal lattice to the simple hexagonal lattice is direct lattice. (10 Marks)

Q4. By using the general reciprocal lattice vector $G(hkl)$, drive a relationship between $d_{hk\ell}$ and direct primitive translation vectors of the Monoclinic ($a \neq b \neq c,\ \ \alpha = \gamma = \pi/2 \neq \beta$) lattice (10 Marks)

Q5. Define the following: (8 Marks)

(1). dispersion relation. (2). phase velocity. (3). group velocity. (4). cutoff frequency.

Q6. (a): Find the phase velocity (V_{ph}) and the group velocity (V_g) at very small and large values of wave vector (k) for acoustical branch of diatomic linear series. (8 Marks)

(b): Monatomic linear series with inter atomic space $a = 3\times10^{-10} m$ and the mass of atom is $3.8\times10^{-23} gm$, if the sound velocity equal to $V_0 = 3\times10^{10} m/\sec$. Calculate the cutoff frequency ($\omega_{\max}$) and force constant (μ). (4 Marks)

Best of luck

Lecturer
Salah. A. H. Almurshidee

Head of Department

Ministry of Higher Education
& Scientific Research
Al-Muthanna University
College of Science
Department of Physics

Subject: Medical Physics
Stage: Fourth
Date: 27/6 /202
Time: 3 Hours

((Assessment of the final exam for the first semester))
Academic year 2023-2024

45

Q1// Fill the empty spaces for the following: (12 Marks)

1. The term Health Physics is used for _____.
2. In the anatomical coordinate system "Proximal" means _____.
3. The weak nuclear force is involved with _____ from the nucleus.
4. Platelets are involved in the _____.
5. In surgery, for indicating the anesthesia level of the patient _____ is used.
6. To increase contrast and to reduce the dose to the patient in the x-ray machine _____ is used.

Q2// Write TRUE or FALSE for the following statements: (12 Marks)

1. Growth of science is depend on growth of ability to measure the quantity.
2. An overweight condition can shift the center of gravity backward so that the vertical projection of it passes underneath the balls of the feet.
3. A small percentage (~5%) of the food is excreted in the feces and urine.
4. If fluid is flowing through the frictionless tube, the velocity decrease in the narrow section.
5. Disc electrodes can be used to measure individual muscle fibers.
6. Electronic hearing aid Possible to obtain amplification of 60 dB.

Q3// Choose correct answer for the following: (12 Marks)

1. Body energy used by brain is _____. (a) 19% (b) 27% (c) 10% (d) 25%
2. When a person drinks through a straw the pressure in his mouth must be:
   (a) Positive (b) negative (c) both positive and negative (d) non of them
3. The left atrioventricular valve controls flow between _____.
   (a) the left ventricle to the aorta (b) the left atrium to the left ventricle
   (c) left ventricle to pulmonary arteries (d) the left atrium and right ventricle.
4. The time scale of the action potential depends on
   (a) type of cell (b) Frequency (c) Amplitude (d) Phase
5. x-ray machine used for an examination of circulatory system is called:
   (a) still picture x-ray (b) Fluoroscopy (c) Angiography (d) Tomography
6. Pressure in normal eye is about _____.
   (a) 12-23 mm of Hg (b) 23-33 mm of Hg
   (c) less than 12 mm of Hg (d) More than 23 mm of Hg

Ministry of Higher Education
& Scientific Research
Al-Muthanna University
College of Science
Department of Physics

Subject: Medical Physics
Stage: Fourth
Date: 27 / 6 / 202
Time: 3 Hours

((Assessment of the final exam for the first semester)) 45
Academic year 2023-2024

Q4// Answer the following: (12 Marks)

A// Summarize the hazards (Precaution) of uses x-ray.

B// Plot and discuss the pressure generated on the spinal column.

Q5// Solve the following: (12 Marks)

A// Calculate the systolic blood pressure in $\frac{Dy}{cm^2}$ and in $\frac{N}{m^2}$?

B// If a man found to consuming energy at 82.1 W, and surface area of 1.92 m^2. What is his BMR expressed in KJ h^{-1} m^{-2}.

*** GOOD LUCK ***

Lecturer
Dr. Ahmed Almurshedi

Head of Department
Asst. Prof. Dr. Muwafaq Fadhil Jaddoa

Ministry of Higher Education
& Scientific Research
Al Muthanna University
College of Science
Department of Physics

Subject: Mathematics
Stage: Second
Date: 27/6/2024
Time: 3 hours

27 JUN 2024

45

((Final Exam/ First Semester))
2023-2024

Q1/ Evaluate the integrals **(10 Mark)**

1- $\int_0^1 \int_0^{\sqrt{1-x^2}} (x^2 + y^2)\, dy\, dx$

2- $\int_0^4 \int_0^1 \int_{2y}^2 \frac{4\cos(x^2)}{2z}\, dx\, dy\, dz$

Q2/ Answer the following: **(10 Mark)**

1- Find the volume of region D enclosed by the surface $z = x^2 + 3y^2$ and $z = 8 - x^2 - y^2$

2- Find the center of mass of constant density δ bounded below by disk $R: x^2 + y^2 \leq 4$ in the plane $z = 0$ and above by the paraboloid $z = 4 - x^2 - y^2$

3- A thin plate covers the triangular region bounded by the x-axis and the line $x = 1$ and $y = 2x$ in the first quadrant .The plate's density at the point (x, y) is $\delta(x, y) = 6x + 6y + 6$. Find the plate's moments of inertia about coordinate axes and the origin

Q3/ Solve as required: **(10 Mark)**

1- Prove the $w_{xy} = w_{yx}$ if $w = \ln(2x + 3y)$

2- Find the derivative of $w = xy$ with respect to t along the path $x = \cos t$, $y = \sin t$ what is the derivative's value at $t = \frac{\pi}{2}$

Q4/ Answer **Two** only: **(10 Mark)**

1- Prove $\nabla(f, g) = f\nabla g + g\nabla f$ if $f(x, y) = x - y$, $g(x, y) = 3y$

2- Find the linearization of $f(x, y) = x^2 - xy + \frac{1}{2}y^2 + 3$ at the point (3,2)

3- Estimate how much the value of $f(x, y, z) = y\sin x + 2yz$ will change if the point $p_0(0,1,0)$ straight toward $p_1(2,2,-2)$

Q5/ **(20 Mark)**

1- Evaluate $\lim_{x\to 0} \frac{\sin x - \tan x}{x^3}$ (*use power series*)

2- Prove $e^{i\pi} + 1 = 0$ (*use power series*)

3- Find the Taylor series and Taylor polynomials generated by $f(x) = \cos x$

Best of luck

Ministry of Higher Education
& Scientific Research
Al Muthanna University
College of Science
Department of physics

Subject: Geometric Optics
Stage: 3rd stage
Date: 27 /6 /2023
Time: 3 hours

27 JUN 2024

45

((Final exam for the second semester))
2023-2024

Q1-A/ Answer by write true or false only. (6 marks)

1) When light falls on the surface of metals like cesium, potassium etc., electrons are given out. These electrons are called 'photo-electrons' and phenomenon is called 'photo-electric effect'.
2) Focal point is any point where light rays parallel to the main axis converge after reflecting off the mirror.
3) The plane mirror has finite radius of curvature, this means the focal point is at infinity.
4) Total internal reflection occurs when the incident angle is less than the critical angle.
5) The retina of the eye is able to detect the light and its colour because of the presence of senses known as rods and cones.
6) Rainbows are the result of the refraction and reflection of light.

Q1- B/ Derive the lens maker formula. (10 marks)

Q2- A/ An astronomical telescope has an objective of focal length (40 cm) and an eyepiece of focal length (4 cm). To view an object which is at (200 cm) away from the objective, the length of telescope must be? (10 marks)

Q2- B/ What is the meaning of Astigmatism? The causes? The correction? (5 marks)

Q3- A/ What are the characteristics of images formed by concave mirror (cases 4, 5 and 6 only) (12 marks)

Q3- B/ What are the advantages of optical fibers? (6 marks)

Q4- A/Derive the combined focal length of two thin lenses in contact? (6 marks)

Q4- B/ What is the radius of curvature of a concave mirror that magnifies an object by a factor of (+3.2) when the object is placed (20) cm from the mirror? (5 marks)

Best of luck

Lecturer

Head of Department