University of Technology
Department of Applied Sciences
Final Examination 2015/2016

Subject: Electronics | **Class: Third class**
Branch: Applied physics | **Time: 3 hours**
Examiner: Dr. Odai N. Salman | **Date:**

Note: answer **four** questions only. (25 Marks)

Q1: (a) Define **four** from the following:

1) Tunnel diode 2) Photoresistor 3) Zener diode 4) junction transistor 5) Slew Rate

(b) What are the differences between the Schottky diode and p-n junction diode?

Q2: Determine the level of *Vo* for each network of Fig.1

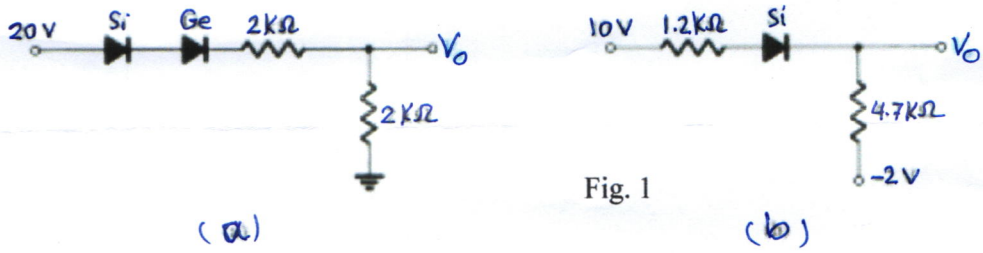


Fig. 1

(25 Marks)

Q3: Determine V_D for the fixed-bias configuration of Fig.2

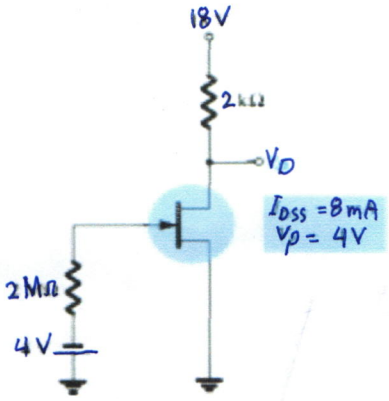


Fig.2

(25 Marks)

Q4: What input voltage results in an output of 2 V in the circuit of Fig.3

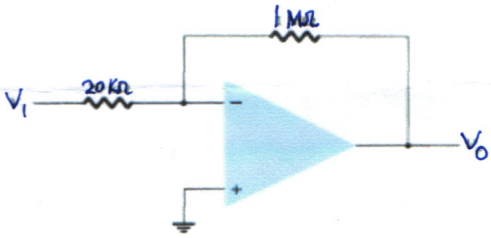


Fig.3

(25 Marks)

Q5: Given the information appearing in Fig. 4, determine:

a) I_C **b)** V_{CC} **c)** β **d)** R_B

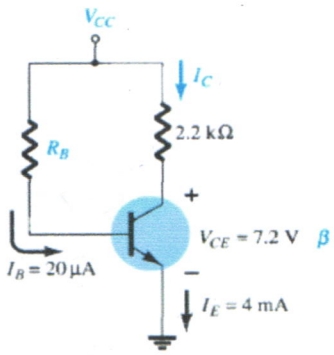


Fig.4

(25 Marks)

Good luck

University of Technology
Department of Applied Sciences
Final Examination 2015/2016

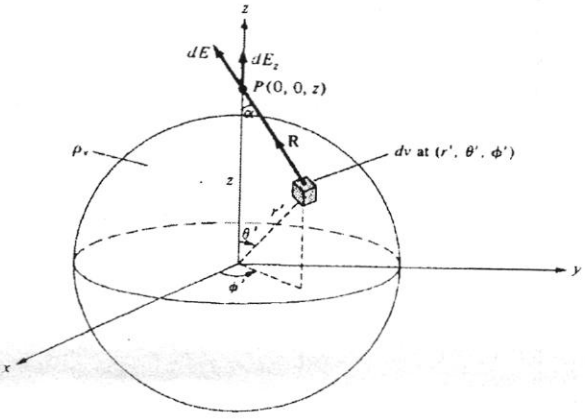
Subject: Electromagnetic
Branch: Applied physics branch
Examiner: Dr. Rabeah Q.Nafil

Class: 3 year
Time: 3 hour
Date: 2nd Attempt

Answer **only four** questions

Q1- The Charge dQ distributes in a volume dv with uniform density ρ_v as shown in the figure. Use Coulomb's law to prove that $\vec{E} = \dfrac{Q}{4\pi\varepsilon_o z^2}\vec{a}$.

(17.5 degree)

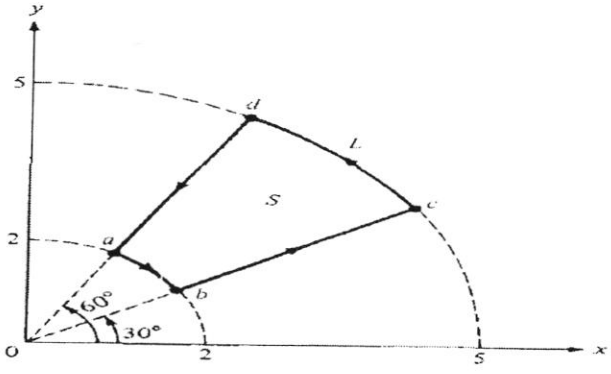


Q2- Classify dielectric materials depending on their permittivity.

(17.5 degree)

Q3- If $\vec{A} = \rho\cos\varphi\vec{a}_\rho + \sin\varphi\vec{a}_\varphi$. Evaluate $\oint A.dl$ around the path shown in the figure. Confirm this using Stokes's theorem.

(17.5 degree)



Q4- Tree points charges -1nC, 4nC, and 3nC are located at (0,0,0), (0,0,1), and (1,0,0) respectively, fined the energy in the system.

(17.5 degree)

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Final Examination 2015/2016

Subject: Electromagnetic
Branch: Applied physics branch
Examiner: Dr. Rabeah Q.Nafil

Class: 3 year
Time: 3 hour
Date: 2nd Attempt

Q5- Consider an infinite current sheet in the $z = 0$ plane. If the sheet has a uniform current density $\vec{K} = K\vec{a}_y$, prove that $\vec{H} = \frac{1}{2}\vec{K} \times \vec{a}_n$.

(17.5 degree)

Good luck

University of Technology
Department of Applied Sciences
mid examination 2015/2016

Subject : optics
Branch : Applied physics
Examiner :Dr. Esam A. Tawfiq

Class: third level
Time : 3 hours
Date :

NOT: ANSWER FOUR QUESTIONS ONLY

Q1)1- If the distance between two slits is 0.050 mm and the distance to a screen is 2.50 m, find the spacing between the first- and second-order bright fringes for yellow light of 600 nm wavelength.

2- If a yellow light with a wavelength of 540 nm shines on a double slit with the slits cut 0.01 mm apart, determine what angle you should look away from the central fringe to see the second order fringe?

Q2)1- Blue light of wavelength 480 nanometers is most strongly reflected off a thin film of oil on a glass slide when viewed near normal incidence. Assuming that the index of refraction of the oil is 1.2 and that of the glass is 1.6, what is the minimum thickness of the oil film?

2- Light of wavelength 750nm passes through a slit 1μm wide. How wide is the central maximum in centimeters, on a screen 20 cm away?

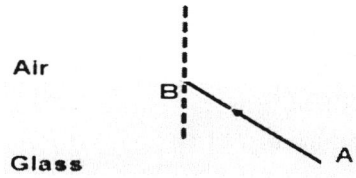
Q3)1- Using a convential two-slits apparatus with light of wavelength 566nm.18 bright fringes per centimeters are observed on a screen 4 m away . What is the slit separation?

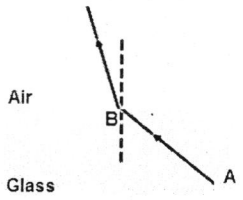
2-Light of wavelength 460 nm falls on two slits spaced 0.300 mm apart. What is the required distance from the slit to a screen if the spacing between the first and second dark fringes is to be 4.00 mm?

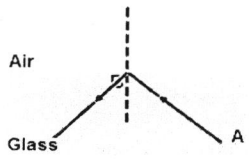
Q4)1- A double-convex thin lens can be used as a simple "magnifier."It has a front surface with a radius of curvature of 20 cm and a rear surface with a radius of curvature of 15 cm. The lens material has a refractive index of 1.52. Answer the following questions to learn more about this simple magnifying lens. (a) What is its focal length in air?
(b) What is its focal length in water (n = 1.33)?

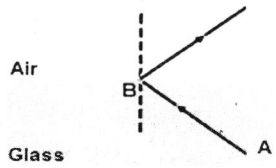
2-A concave lens has a focal length of 6 cm. The focal point F is 6 cm in front of the lens, a 3 cm tall object is placed on the same side of the lens as F. The object distance is 9 cm. Find and describe the image of the object formed.

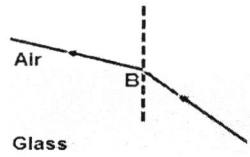
Q5)1- . A light ray AB passes from glass into air at the critical angle. Which of the following diagrams represents the refracted ray?

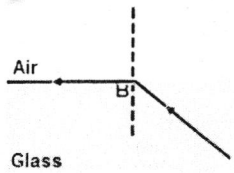












2- A small cup of green tea is positioned on the central axis of a spherical mirror. The magnification of the cup is +0.250, and the distance between the mirror and its focal point is 2 cm. (a) What is the distance between the mirror and the image it produces? (b) Is the focal length positive or negative? (c) Is the image real or virtual?

GOOD LUCK

University of Technology
Department of Applied Sciences
Final Examination
2015 -2016

Branch: Applied Physics
Subject: Quantum Mechanics
Examiner: Dr. Mukhlis M. Ismail

Class : 3rd year
Time : 3 hours
Date :

Note: Answer 4 questions only. (25 points for each question)

Q1/ A) Give the meaning of the following: (18 points)

1) Eigen Value Equation, 2) $[\alpha, \beta] = \text{zero}$, 3) $-\frac{\hbar}{i}\int_{-\infty}^{\infty} \psi_x \frac{d\psi_x}{dt}\, dx$,

4) $\langle\psi|\psi\rangle = 1$, 5) Tunnel Effect 6) Zero point energy.

B) Electron with an energy of 1 eV is incident on a barrier 10 eV high and 0.5 nm wide. Find the transmission probability. ($m_e = 9.1 \times 10^{-31}$ kg, $\hbar = 1.05 \times 10^{-34}$ J. sec) (7 points)

Q2/ A) A particle is represented by the wave function

$$\varphi(x) = \begin{cases} A(a^2 - x^2) & if \quad -a \le x \le +a \\ 0, & otherwise \end{cases}$$

Determine the normalization constant and expectation value of position (x). (12 points)

B) Given that $\psi_{x,t} = \cos(kx - \omega t) + i\sin(kx - \omega t)$,

1- Drive kinetic energy operator.

2- Show that $\psi_{x,t}$ is a solution of time independent Schrodinger equation for free particle in one dimension. (13 points)

Q3/ A) Drive the time dependent Schrodinger Equation. (12 points)

HX

B) Find the commutator between Hamiltonian and position operator, then find $\frac{d<x>}{dt}$ using Ehrenfest Theorem and compare your result with classical. (13 points)

Q4/ A) Find the probability and expectation value of x that a free particle trapped in a one dimensional box can be found between 0.4L and 0.5L for the ground state. (15 points)

B) Find the eigen value (a_n) and eign function (ψ_n) of the operator A where A= –i ∂/∂ x and ψ_n is a periodic function at distance L. (10 points)

Q5/ A) Using the ladder operator $a_{\pm} = \frac{1}{\sqrt{2\hbar m\omega}}(\mp ip + m\omega x)$ to find ground state wave function (ψ_o) for the harmonic oscillator. (13 points)

$\frac{\partial^2\psi}{\partial x^2} + \frac{2m(E\psi}{\hbar} = 0$

B) Find [x, p] and $[a_+, a_-]$. (12 points)

$-\frac{\hbar}{i}\int_{-\infty}^{\infty} \psi_x \frac{d\psi}{dt}\, dx$ $\quad i\hbar\frac{\partial\psi}{\partial t}\psi_+$