Total No. of Printed Pages: 03

F.E. Semester - I (Revised Course 2007-08)
EXAMINATION Aug/Sept 2019
Applied Science-I (Physics & Chemistry)

[Duration : Three Hours] **[Max. Marks : 100]**

Instructions:
1) Answer **one** question from **each** Module.
2) Answer the **two** Sections in **separate** answer books.
3) Assume additional data, **if required.**
4) Draw diagrams **wherever** required.

Applied Science-I (Physics)
MODULE I

Q.1
a) Write a short note on antireflection films. Briefly explain amplitude and phase requirement in such films. **(5)**
b) Drive an expression for conductivity of an intrinsic semiconductor in terms of mobility and carrier concentration. Hence write down the expression for resistivity of a n-type semiconductor. **(5)**
c) White light is incident on a thin film at an angle of 30^o. The reflected light when observed with a spectroscope, two consecutive dark bands corresponding to wavelengths 5890 and $5790A^o$ are seen. Determine the thickness of the thin film if its R. I. is 1.4 **(5)**
d) Briefly explain the physical origin of Hall Effect. Obtain an expression for Hall voltage. How does Hall effect help in **(10)**
i) Identifying the type of semiconductor
ii) Determining the mobility of charge carriers

Q.2
a) Explain the concept of carrier diffusion in a semiconductor. Obtain an expression for total current density due to drifting and diffusion of charge carriers. **(5)**
b) The resistivity of a pure semiconductor strip of length 5cm, thickness 2mm and breadth 5mm at room temp. is found to be $2000\Omega - m$. Calculate the number of electrons in the conduction band if mobility of electrons and holes are $0.14m^2/V.s.$ and $0.05m^2/v.s.$ respectively. **(5)**
c) Derive the condition for dark interference fringes due to transmitted light from a thin parallel film. **(5)**
d) What are Newton's rings? How are they formed? Show that the radii of dark Newton's rings are proportional to square root of the natural numbers. Hence describe the method for determination of the wavelength of monochromatic light by Newton's rings method. **(10)**

3729936050BC42B0BE7A883FDE48B78F

MODULE II

Q.3
a) Explain piezoelectric method to produce ultrasonic waves. **(5)**
b) Describe the construction and working of electrostatic lens. **(5)**
c) Explain the working of GM counter. In what way it differs from ionization chamber. **(5)**
d) State four properties of ultrasonic waves. Briefly explain acoustic diffraction method of detecting USW. How is this method useful to determine the velocity of USW? **(10)**

Q.4
a) Draw a block diagram of CRO and mention its principle sections. Briefly explain its application to determine amplitude of a dc voltage. **(5)**
b) Write down five properties of ultrasonic waves. **(5)**
c) Briefly explain basic principle of the following: **(5)**
i) magnetic lens
ii) cavitation
d) Describe principle and working of a GM counter. State the physical significance of quenching carried out in it. How does a GM counter differ from a proportional counter? **(10)**

Applied Science-I (Chemistry)
MODULE III

Q. 5
a) Outline the construction of a Calomel Electrode and illustrate how it can be used to as reference electrode to find the pH an unknown solution. **(8mk)**
b) Derive the equation to express the electrode potential for the following system Al/Al^{3+} (xM) . **(6mk)**
c) Explain how the following characteristics affect a battery system a) Type of battery b) Capacity c) Operating temperature. **(6mk)**
d) With the help of a neat labeled diagram explain the construction of the Zn- Air Battery. **(5mk)**

Q. 6
a) The following metals are provided: Zn, Sn and CU and their metal salt solutions in concentrations of 0.1, 0.01, 0.001M are available. Using the above materials construct i) Voltaic type Cell and ii) Concentration cell, that would give the highest cell potential and calculate the cell potential at 25^oC. (Data : $E^0_{Zn} = -0.76\,V, E^0_{Sn} = -0.14V, E^0_{Cu} = 0.34\,V$) **(8mk)**
b) Define the following terms i) Capacity of a Battery ii) Fuel Cell iii) Electrode Potential. **(6mk)**
c) Outline the characteristics of the Electrolyte in the following fuel cells: a) Phosphoric acid Fuel Cell b) Solid Polymer Electrolyte Fuel Cell c) Solid Oxide Fuel Cell. **(6mk)**
d) With the help of a neat labeled diagram explain the construction of Glass electrode and write the equation for its electrode potential. **(5mk)**

MODULE IV

Q.7	a)	Explain how corrosion can be controlled by sacrificial anodic protection and impressed current protection.	**(8mk)**
	b)	Explain how a metallic structure can be protected against corrosion by using metal coatings.	**(6mk)**
	c)	Outline any three methods that can be used for Metal Finishing.	**(6mk)**
	d)	Describe the process of PCB preparation using Electroless Plating technology.	**(5mk)**
Q.8	a)	Describe with the help of a suitable example the electrochemical mechanism of corrosion.	**(8mk)**
	b)	Describe the process of use of inorganic coatings for corrosion protection with the help of a suitable example.	**(6mk)**
	c)	Outline the various constituents and their role in an Electroless plating bath.	**(6mk)**
	d)	Explain the process of Electroplating with Gold.	**(5mk)**

3729936050BC42B0BE7A883FDE48B78F