SEM 1 – 2 (RC 07 – 08)

F.E. (Semester – I) (RC 2007 – 08) Examination, November/December 2018
APPLIED SCIENCE – I (Physics & Chemistry)

Duration : 3 Hours | Max. Marks : 100

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

(Physics)

MODULE – I

1. a) Prove that in reflected light radii of dark Newton's rings are proportional to square root of natural numbers. **5**

   b) Find the diffusion coefficients of electrons and holes of a semiconductor at 27°C, if mobilities of electrons and holes are 0.18 and 0.026 $m^2V^{-1}s^{-1}$ respectively at 27°C. **5**

   c) How are colours exhibited by thin films ? Briefly explain necessity of an extended source to observe interference pattern in thin parallel films. **5**

   d) What is continuity equation ? Derive equation of continuity for excess carriers in a semiconductor. **10**

2. a) Derive en expression for fringe width in a wedge shaped film. **5**

   b) In a Newton's rings experiment for reflected light, the diameter of 10^{th} bright ring changes from 0.477 cm to 0.410 cm when a liquid is introduced between lens and glass plate. Calculate R.I. of the liquid. Find radius of curvature of lens if $\lambda = 6000$ A°. **5**

   c) Obtain an expression for Hall coefficient for an extrinsic semiconductor. Show that the result of Hall effect may be used to deduce carrier concentration. **5**

   d) What do you understand by antireflection coating ? Highlight their important applications. Explain the formation of Newton's rings and show that the radii of dark rings are proportional to square root of the natural numbers. **10**

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MODULE – II

3. a) Explain magnetostriction method to produce ultrasonic waves. Draw the necessary circuit diagram. 5

   b) Write short note on the following : 5

      i) Electrostatic lens

      ii) Proportional counter.

   c) Explain construction and working of magnetostatic lens. 5

   d) Draw schematic diagram of a cathode ray tube and its principle parts. Briefly describe their functions. Give an application of CRO. 10

4. a) Describe the principle and working of an ionisation chamber. How does it differ from a proportional counter ? 5

   b) An ultrasonic transducer of frequency 100 MHz is used to make acoustic grating out of water column in a vertical tube closed at one end. A monochromatic light of wavelength 590 nm is used to form first order diffraction at an angle of 2°15′. Determine the velocity of ultrasonic waves. 5

   c) Briefly describe the basic principle of the following : 5

      i) Magnetic lens

      ii) Cavitation.

   d) State three methods of detection of ultrasonic waves. Give an account of piezoelectric method for production of ultrasonic waves. How is this method better than magnetostriction oscillator ? 10

(Chemistry)

MODULE – III

5. a) Derive the equation to express the electrode potential for the following system $Ag^{+}_{(0.01M)}/Ag$ and calculate its Electrode potential. (Data given $E^{0}_{Ag} = 0.8$ V) 8

   b) Describe the functioning of Solid Polymer Electrolyte and Molten Carbonate Fuel Cell system. 6

   c) Define the terms battery and Fuel Cell and outline its basic setup. 6

   d) Describe the principle behind functioning of a concentration cell and outline its construction with a suitable example. 5

6. a) Describe the process of determination of standard electrode potential of a metal with the help of a suitable example. **8**

   b) Explain the basic setup of Fuel Cell with the help of a suitable example. **6**

   c) Outline any six characteristics of a battery system. **6**

   d) With the help of a neat labelled diagram explain the construction of Calomel Electrode and outline the reactions involved therein. **5**

MODULE – IV

7. a) Explain the phenomenon of Differential Aeration Corrosion with regard to Pitting and Waterline Corrosion. **8**

   b) Explain how a metallic structure can be protected against corrosion by using Cathodic Protection method. **6**

   c) Explain the basic setup of an Electroplating bath with the help of a suitable example. **6**

   d) Describe the process of electroless plating using suitable example. **5**

8. a) Describe the mechanism of Dry or Chemical corrosion in case of oxidation and how the corrosion product affects the corrosion resistance. **8**

   b) Explain the process of tinning with the help of a neat labeled diagram. **6**

   c) Outline the various constituents of an Electroless plating bath. **6**

   d) Explain the process of Electroplating with Gold. **5**
