Heaven's Light Is Our Guide

RAJSHAHI UNIVERSITY OF ENGINEERING & TECHNOLOGY
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
1st Year Backlog Examination 2017

COURSE NO: **Phy 1213** COURSE TITLE: **Physics**
FULL MARKS: **70** TIME: **3 HRS**

N.B. (i) Answer any **SIX** questions taking any **THREE** from each section.
(ii) Figures in the right margin indicate full marks.
(iii) Use separate answer script for each section.

SECTION : A

Q.1. (a) Describe in detail the experiment to determine the wavelength of sodium light with a Fresnel's bi-prism. 6

(b) Why do colours appear in thin film in white light? 3

(c) Light form a sodium vapour lamp ($\lambda = 589nm$) forms an interface pattern on a screen 0.8m from a pair of slits. The bright fringes in the pattern are 0.35cm apart. What is the slit separation? 3

Q.2. (a) Classify solids in terms of atomic arrangement. 2

(b) What are the Miller indices? Obtain a relation between the inter-planer spacings and the cube edge. 6

(c) Deduce Bragg's law for the diffraction of X-rays in crystals. 4

Q.3. (a) Explain the formation of Newton's rings. Show that the square of the diameters of bright rings are directly proportional to the odd integers. 5

(b) Newton's rings are formed by light reflected normally from a plano-convex lens and a plane glass plate with a liquid between them. The diameter of the n^{th} dark ring is 0.218 cm and that of $(n+12)^{th}$ dark ring is 0.461 cm. 4

(c) Prove that the violet ($\lambda \approx 4000\,\mathring{A}$) of the third order visible spectrum overlaps the red ($\lambda \approx 7000\,\mathring{A}$) of the second order. 3

Q.4. (a) What is specific rotation? Explain how you would use a Laurent's half-shade polerimeter to determine the specific rotation of sugar. 5

(b) Explain the different states of polarization of light in terms of electric vector, $\vec{E}$. 4

(c) Define Brewster angle for polarization by reflection. Will it depend upon the refractive index of the medium from which the reflection occurs? 3

SECTION : B

Q.5. (a) Find the expression for the velocity of electron in the n^{th} Bohr orbit. 4

(b) An electron has a de-Broglie wavelength of 2.0 pm. Find its Kinetic energy and the phase and group velocity of its de-Broglie waves. 4

(c) Compute the number of photons of yellow light of wavelength $6000\,\mathring{A}$ required to make an erg of energy, 1 Joule = 10^7 erg. 4

Q.6. (a) Show that the charge on the capacitor in a LC circuit oscillates simple harmonically and hence obtain an expression for the frequency of oscillations. 6

(b) A simple harmonic oscillator is characterized by, $y = a\cos\omega t$. Calculate the displacement at which kinetic energy is equal to its potential energy. 3

(c) The velocity of a simple harmonic wave is 30 cm/s. At a time t=0, the displacement of a particle is given by, $y = 4\sin 2\pi(x/100)$. Find the equation for the displacement at a time t=2 sec. 3

Q.7. (a) Obtain expressions for the Kinetic energy and direction of the recoil electron in compton scattering. 5

(b) An X-ray photo collides with an electron at rest and its scattered through 90^0. What is the frequency after collision? Its initial frequency is 3×10^{19} Hz. 3

(c) In an oscillator circuit, $L = 0.2H$, $C = 0.0012\mu F$. Find the maximum value of resistance so that the circuit may oscillate. 4

Q.8. (a) Examine the effect of a periodic force on a damped oscillator. Discuss the transient part as well as the steady state term in the complete solution. 7

(b) Prove the in a progressive wave half the energy of a wave is Kinetic and the other half is potential. 5

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