

Hearson's Light Is Our Guide
RAJSHAH 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 6

- Q.1. (a) Describe in detail the experiment to determine the wavelength of sodium light with a Fresnel's bi-prism. 6
- 30 (b) Why do colours appear in thin film in white light? 3
- 30 (c) Light from a sodium vapour lamp ($\lambda = 589\text{nm}$) forms an interference 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-planar 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 $(n+12)^{\text{th}}$ dark ring is 0.461 cm. 4
- (c) Prove that the violet ($\lambda \approx 4000 \text{ \AA}$) of the third order visible spectrum overlaps the red ($\lambda \approx 7000 \text{ \AA}$) of the second order. 3
- Q.4. (a) What is specific rotation? Explain how you would use a Laurent's half-shade polarimeter 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

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 \AA required to make an erg of energy, $1 \text{ Joule} = 10^7 \text{ erg}$. 4
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 $t=2 \text{ sec}$. 3
7. (a) Obtain expressions for the Kinetic energy and direction of the recoil electron in Compton scattering. 5
(b) An X-ray photon collides with an electron at rest and is scattered through 90° . What is the frequency after collision? Its initial frequency is $3 \times 10^{19} \text{ Hz}$. 3
(c) In an oscillator circuit, $L = 0.2 \text{ H}$, $C = 0.0012 \mu\text{F}$. Find the maximum value of resistance so that the circuit may oscillate. 4
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 that in a progressive wave half the energy of a wave is Kinetic and the other half is potential. 5