Heaven's Light Is Our Guide

RAJSHAHI UNIVERSITY OF ENGINEERING & TECHNOLOGY
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
4th Year Backlog Examination 2020

COURSE NO: **Phy 1213** COURSE TITLE: **Physics**

FULL MARKS: 72 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

			Marks
Q.1.	(a)	Explain the conclusion of the Rutherford alpha particle scattering experiment.	3
	(b)	Apply Bohr's theory to explain the spectra lines of hydrozen atom. Compare the energy levels of hydrozen atom with those of singly ionized helium.	5
	(c)	Calculate the radius of the electron in the nth orbit of hydrozen atom. Show that the velocity of the electron in the first Bohr orbit of the hydrozen atom is (1/137)C, where 'C' is the velocity of light.	4
Q.2.	(a)	Explain the laws of photo-electric emission.	4
	(b)	Explain de Broglie phase and group velocities. Show that the de Broglie group velocity associated with a moving particle is equal to the velocity of the particle.	5
	(c)	An X-ray of frequency 3.0×10^{19} Hz undergoes Campton scattering with an electron at rest and is scattered through an angle of 90°. Compute the frequency of the scattered X-ray.	3
Q.3.	(a)	Derive and solve the differential equation for a particle executing simple harmonic equation. Explain the important features of the solution of the Differential equation of simple harmonic motion.	5
	(b)	Explain how Lissajous figures form in SHM. Obtain the resultant motion of a particle in influenced by two mutually perpendicular simple harmonic motions having same frequency but different phases and amplitudes.	4
	(c)	What is damping factor? Show that the smaller the damping the greater will be the quality factor of a damped oscillator.	3
Q.4.	(a)	What is progressive wave? Find an expression for the energy transformation per unit volume of this wave.	5
	(b)	What are beats? Find the time interval between two consecutive maxima and minima.	4
	(c)	Deduce the differential equation of wave motion.	3

SECTION : B

			Marks
Q.5.	(a)	What are the important points of wave theory and quantum theory of light? Explain in short the success of these two theories of light.	4
	(b)	What is the result of Young's double slit experiment? Show that in Young's double slit experiment, the fringe width is given by- $\beta = \frac{D\lambda}{d}$, where the symbols have their usual meanings.	5
	(c)	In a Young's double slit experiment, the slit is illuminated by monochromatic light of wavelength 546 nm and the two slits are separated by a distance of 0.01 cm. Find the angular position of eight maximum.	3
Q.6.	(a)	What are coherent sources? Describe how they are realised in practice.	4
	(b)	Describe a method for determining the refractive index of a liquid.	5
	(c)	The diameter of the 15th ring was found to be 0.590cm and that of the 5th ring was 0.336 cm in a Newton's rings experiment. If the radius of the Plano-convex lens is 100 cm. Calculate the wavelength of light used.	3
Q.7.	(a)	Distinguish between Fresnel and Fraunhofer classes of diffraction.	3
	(b)	Explain Fraunhofer diffraction from a single slit and deduce the condition for maxima and secondary minima. Further show that the half-width of the principal maxima depends upon the wavelength of the light.	6
	(c)	Deduce the missing orders for a double slit Fraunhofer diffraction pattern if the widths are 8.8×10^{-3} cm and they are 4.4×10^{-2} cm apart.	3
Q.8.	(a)	Explain elliptically and circularly polarized light.	3
	(b)	Describe the working principle of Nicol prism and its use for the production of polarized light. Why the short edges of Nicol prism are grounded.	6
	(c)	At what angle will light travelling in air be completely polarized horizontally when reflected from (i) water and (ii) from glass?	3

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