CSE (A)/ 16 Series/ CT1/ Time: 30 min/ Full Marks: 20

1. How interference takes place in thin films? Show that the reflected and transmitted interference patterns in a thin film is complimentary. 10

2. Discuss why two independent sources of light of the same wavelength cannot produce interference fringes. 5

3. Green light of wavelength 5100Å from a narrow slit is incident on a double slot. If the overall separation of 10 fringes on a screen 200 cm away is 2cm, find the slit separation. 5

CSE (A) 2nd Sem 16 Series, Course No. Phy 1213 Course Title: Physics CT#2 (MNZ)

Q 1	Define the quality factor of a damped oscillator. Deduce an expression for it	06
Q 2	Show the energy of a damped harmonic oscillator falls to 1/e of its initial value in an interval of time equal to the relaxation time	06
Q 3	A simple pendulum has a period of 1.2 second and amplitude of 10 degree. After 10 complete oscillations, its amplitude has been reduced to 5 degree. Calculate the relaxation time and quality factor of the pendulum	05
Q 4	Give the reason of power dissipation of a damped harmonic oscillator	03

Class Test 2, 2nd Semester, CSE (A) / 16 Series, Marks: 20, Time: 30 min

1. By Brewster's law show that light incident on a transparent substance at polarizing angle gives reflected and refracted rays at right angle to each other. What does the law become when the rays of light travel from denser to rarer medium? 5
2. How Nicol prism cab be used as polarizer and analyzer? Explain in detail with the help of diagram. 10
3. A 20 cm long tube containing sugar solution is placed between crossed Nicols and illuminated by light of wavelength of 6000 Å. If the specific rotation is 60° and optical rotation is 12°, what is the strength of the solution? 5

Class Test #2, Course No. Phy1213, Course Title: Physics, CSE (A)/16 Series

Q.1	Show that the velocity of a harmonic oscillator is maximum at minimum displacement.	05
Q.2	Diagrammatically show the phase relationships among displacement, velocity and acceleration of a harmonic oscillator.	05
Q.3	Show that the charge on the capacitor in an LC circuit oscillates simple harmonically?	05
Q.4	A particle of mass 1 gm moves in a potential energy well given by, $U = U_0+6x+x^2$. Find the force constant, frequency of oscillations and the position of equilibrium.	05

Class Test 2, 2nd Semester, CSE (B) / 16 Series, Marks: 20, Time: 30 min

1. Explain 'plane of polarization' and 'plane of vibration' for plane-polarized light. 5
2. Explain the action of i) pile of plates ii) a tourmaline crystal in producing plane-polarized light. 10
3. By Brewster's law show that light incident on a transparent substance at polarizing angle gives reflected and refracted rays at right angle to each other. What does the law become when the rays of light travel from denser to rarer medium? 5

Heaven's light is our guide

Rajshahi University of Engineering & Technology

B.Sc. Engineering 1st Year **Even Semester** Examination, **2017**

Department of Computer Science & Engineering

Course no **Phy 1213** Course Title **Physics**

Full marks **72** Time **Three (03) hours**

N.B. Answer **six** questions, taking **three** from each section.
The questions are of equal value.
Use separate answer script for each section.

SECTION-A

Q1 (a) With reference to crystals, explain the terms (i) unit cell, (ii) single crystal and coordination member. What are the values of coordination members of sc, bcc and fcc structures? 3

(b) Calculate packing fraction in case of bcc and fcc structures. $3\frac{1}{2}$

(c) What are the parameters used to specify a unit cell? Give the unit cell specifications for cubic, orthorhombic and triclinic structures. 3

(d) Distinguish between metal and insulator in terms of energy bands. $2\frac{1}{2}$

Q2. (a) Show that the interference of two light waves causes the redistribution of light energy and the resultant interference pattern is in accord with the law of conservation of energy. 5

(b) Show that the fringe width is given by $\beta = \frac{D\lambda}{d}$, symbols have their usual meanings. 4

(c) Mention few practical applications of the interference from thin films. 3

Q3. (a) Discuss Fraunhofer diffraction of monochromatic light from a single slit and show that the intensity of the secondary maximum is roughly 4.5% of that of the principal maxima. 6

(b) Find the missing orders in a double slit diffraction pattern. 3

(c) How many orders will be visible if the wavelength of incident radiation be 5000 Å and the number of lines on the grating be 14000 per inch? (1 inch = 2.54 cm) 3

Q4. (a) Explain plane of polarisation and plane of vibration for the plane polarised light. 3

(b) Explain the action of (i) pile of plates and (ii) a tourmaline crystal in producing plane polarised light. 4

(c) How a Nicol prism is used to analyse plane polarised light 3

(d) A 20cm long tube containing sugar solution is placed between crossed Nicols and illuminated by light of wave-length of 6000Å. If the specific rotation is 60° and optical rotation is 12°, what is the strength of the solution? 2

SECTION-B

Q5. (a) Based on Bohr's assumption, obtain the expression for the orbital energy of an electron in the hydrogen atom. 5

(b) Explain the laws of photoelectric emission. Discuss the failure of classical theory to explain the experimental facts observed in photoelectric effect. 3

(c) Describe the working of a photo-voltaic cell. 4

Q6. (a) Obtain an expression for the change in wavelength of a photon undergoing Compton scattering. What is Compton wavelength? 6

(b) Explain the reason of the presence of both modified and unmodified in the spectrum of Compton scattered radiation. 3

(c) Show that the de Broglie phase velocity $v_p = f\lambda$ is always greater than the velocity of light in free space. 3

Q7. (a) Define simple harmonic motion. Derive a general differential equation of motion of a simple harmonic oscillator and obtain its solution. 6

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(b) What are Lissajous figures? Calculate the resultant of two simple harmonic vibrations at right angle when their periods are in the ratio of 2:1 and there is a phase difference 0 and $\frac{\pi}{2}$. 6

Q8. (a) Explain free vibrations, forced vibrations and resonance by giving one example of each. 3 2

(b) For a plane progressive wave, show that on the average half the energy is kinetic and half potential. 6

(c) A wave of frequency 400Hz is travelling with a velocity $800ms^{-1}$. How far are two points situated whose displacements differ in phase by $\frac{\pi}{4}$. 3 3

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