# BRAINWARE UNIVERSITY

## Term End Examination 2023

## Programme – B.Tech.(CSE)-2018/B.Tech.(ECE)-2018/B.Tech.(ECE)-2019/B.Tech.(CSE)-2019/B.Tech.(CSE)-2020/B.Tech.(ECE)-2020

## Course Name – Physics

## Course Code - BPHY010101/BSC(ECE)102/BSC(CSE)102

## ( Semester I )

**Full Marks : 60** **Time : 2:30 Hour**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

### Group-A

(Multiple Choice Type Question) 1 x 15=15

1. *Choose the correct alternative from the following :*

(i) In Fresnel diffraction the source of light is effectively at

a) Finite distance b) Infinite distance
c) Both finite and infinite d) None of these

(ii) From the polarization of light, one can conclude that

a) Light is a transverse wave b) Light is a longitudinal wave
c) Light can bend while facing a sharp edge of an object d) None of these

(iii) For small value of damping constant, the quality factor

a) Decreases b) Increases
c) Remain constant d) None of these

(iv) Ray diverging from a point source form a wave front that is

a) Cylindrical b) Spherical
c) Plane d) Cubical

(v) In a half-wave plate, the phase difference between the O-ray and E-ray is

a) $\pi/2$ b) $\pi$
c) 0 d) None of these

(vi) If the refractive index of water is 1.33, the polarizing angle of light reflected from the surface of a pond is given by

a) $\cos^{-1}(1.33)$ b) $\cot^{-1}(1.33)$
c) $\tan^{-1}(1.33)$ d) $\sin^{-1}(1.33)$

(vii) When the compact disk is illuminated by a source of white light, coloured lines are observed, this is due to

a) Dispersion b) Diffraction

c) Interference d) Refraction

(viii) If light is incident at the angle of polarization then the angle between the reflected ray and refracted ray is

a) $\pi/2$ b) $\pi/4$

c) $\pi$ d) $3\pi/2$

(ix) For laser action to occur, the medium used must have at least

a) 4 energy levels b) 2 energy levels

c) 3 energy levels d) 5 energy levels

(x) In the structure of fiber optic cable refractive index of core is always -------- the refractive index of cladding

a) Less than b) Equal to

c) Greater than d) None of these

(xi) For small value of damping constant, the resonance

a) Is flat b) Is sharp

c) Remains same d) None of these

(xii) Intensity of light depends upon

a) Velocity b) Wavelength

c) Amplitude d) Frequency

(xiii) In Michelson's interferometer 100 fringes across the field of view when the movable mirror is displaced through 0.0248 mm, the wavelength of monochromatic light used is

a) 585.6 nm b) 589 nm

c) 556 nm d) 555.5 nm

(xiv) A guitar string has a length of 0.5 m, if the string is vibrating with a wavelength of 0.25 m, it is vibrating at harmonic

a) First b) Second

c) Third d) Forth

(xv) The number of optic axes in a uniaxial crystal is

a) 1 b) 2

c) 5 d) 10



## Group-B

(Short Answer Type Questions) 3 x 5=15

2. Establish the differential equation of LCR circuit. (3)

3. Explain plane of polarization and plane of vibration with a diagram. (3)

4. What are the characteristic of Simple Harmonic Motion? (3)

5. Write down the differential equation of forced vibration. (3)

6. Illustrate the working principle of Nicol prism as polarizer. (3)

**OR**

Deduce the missing orders for a double-slit Fraunhofer diffraction pattern if the slit widths are 0.16 mm and they are 0.8 mm apart. (3)

## Group-C

(Long Answer Type Questions) 5 x 6=30

7. State the full form of LASER. Stimulated emission is used in laser action instead of spontaneous emission. Describe the reason. (5)

8. Explain the working principle of Ruby laser with energy level diagram. (5)

9. Derive the relation $v_g = v_p - \lambda \frac{dv_p}{d\lambda}$. (5)



10. In Young's double slit experiment, derive the conditions for constructive and destructive interference patterns. (5)

11. 9 kg mercury is poured into a glass U-tube with a uniform internal diameter of 1.2 cm. It oscillates freely about its equilibrium position. Calculate the time period of oscillation of mercury column. (5)

12. Write down the expression for intensity due to Fraunhofer double slit diffraction. Draw the intensity distribution curve for the same. (5)

**OR**

Express the relationship between Einstein's A and B coefficients. (5)

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