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Total Number of Pages : 02

B.Tceh
15BS1102

2nd Semester Back Examination 2018-19

PHYSICS

BRANCH : AUTO, CHEM, CIVIL, CSE, ECE, EEE,
ELECTRICAL, ETC, FAT, IEE, IT, MECH, MME, PE

Max Marks : 100

Time: 3 Hours

Q.CODE : F529

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part- I

Q1 Only Short Answer Type Questions (Answer All-10) (2 x 10)

- a) What is oscillatory motion? Mention the characteristics of this type of motion.
- b) What is interference? Can longitudinal waves exhibit interference?
- c) What is the condition for the destructive interference in terms of phase difference between the two interfering waves?
- d) Distinguish between a zone plate and a convex lens.
- e) What is polarization of light?
- f) What is double refraction? Name two crystals which exhibit double refraction.
- g) Define gradient of a scalar field. Is it a vector or a scalar?
- h) Evaluate curl A, where $A = ix + jy + kz$.
- i) What is Compton effect? Write expression for Compton shift.
- j) State de-Broglie hypothesis for matter wave.

Part- II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- a) Setup the differential equation for a one-dimensional simple harmonic oscillator. Write the general solution. Show that the total energy of the oscillator is constant in time.
- b) What is wave motion? Distinguish between wave velocity and group velocity.
- c) Show analytically that circular fringes are produced in Young's two source arrangement if the screen is placed longitudinally with respect to the two sources.
- d) Describe the construction of a biprism. Describe the experimental arrangement for determination of wavelength of monochromatic light using biprism.
- e) Show that the Fresnel's half period zones have the same area.
- f) What is zone plate? Show that it has multiple foci.
- g) What is half wave plate? Why is it so named? Can it be used as half plate for all colors of light? Explain.
- h) Give the construction of Nicol prism. Explain how it produces polarized light.
- i) Distinguish between conduction current and displacement current.
- j) A vector field is given by $A = i2xy + jx^2y + kxyz$. Find the divergence and curl of the vector at the point (1, 1, -1).
- k) What is the expectation value? A particle moving along x-axis has the wave function,

$$\psi(x) = bx \text{ between } x=0 \text{ and } x=1$$

$$= 0 \text{ elsewhere}$$

Find the expectation value $\langle x \rangle$ of the particles position.

- l) The wave function for certain particle is given as $\psi = \cos^2 x$ for $-\frac{\pi}{2} < x < \frac{\pi}{2}$.

Normalise the wave function in the given range.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3** Setup the differential equation for a one-dimensional oscillator, subjected to a damping force proportional to velocity and an external periodic force. Derive the condition of resonance. How does the maximum amplitude at resonance depend on the damping constant? **(16)**
- Q4** What is diffraction? Differentiate between Fresnel and Fraunhofer type of diffraction. Find the condition for the principal maximum and secondary maximum in the single slit diffraction pattern. **(16)**
- Q5** Derive the Maxwell's electromagnetic equations in differential form in a medium in the presence of charge and currents. Identify and state the laws of electromagnetism with which these equations are associated. **(16)**
- Q6** Derive the time independent and time dependent Schrodinger's equation for one dimensional system and hence find out the energy of a free particle? **(16)**