Seat No. _____

HAK-003-2015026

B. Sc. (Sem.-V) (WEF-2019) Examination

May - 2023

Physics : P-502

(Electrodynamics & Spectroscopy)

(New Coures)

Faculty Code : 003

Subject Code : 2015026

Time : $2\frac{1}{2}$ Hours / Total Marks : **70**

Instructions :

(1) All questions are compulsory.

(2) Figures on right hand side indicate marks.

(3) Symbols have their usual meaning.

1 (a) Answer the following questions : (1 mark each) **4**

(1) Charges are redistributed and atomic (or molecular) dipole is produced, such substance is called _____.

(2) Torque on rectangular loop, when applied uniform magnetic field is given by _____.

(3) Magnetic dipole moment per unit volume is called _____.

(4) Differential form of Ampere's law in Magnetized material is _____.

(b) Answer in brief : (any 1 out of 2) **2**

(1) Define linear media.

(2) If Hydrogen atom is placed in an electric field of 5×10^5 N/C an its Polarizability is 7.34×10^{-30} C^2N/m. find its dipole momentum.

(c) Answer the following : (any 1 out of 2) **3**

(1) Explain the magnetization of material.

(2) Explain force on dipole due to non-uniform external electric field.

(d) Answer in detail : (any 1 out of 2) **5**

(1) Give the physical interpretation of bound current.

(2) Discuss torques and forces on magnetic dipoles.

2 (a) Answer the following questions : (one mark each) **4**

(1) Write ohm's law for electrodynamics.

(2) Electromotive force is given by _____.

(3) Write flux rule for motional emf.

(4) The integral form of Ampere's law is _____.

(b) Answer in brief : (any 1 out of 2) **2**

(1) Find the self-inductance of a long solenoid having 'n' numbers of turn per unit length. The radius is r.

(2) A solenoid of radius 2 cm has self-inductance 100 mH. If current flowing through is 1A. Find the energy stored in magnetic field of solenoid.

(c) Answer the following questions : (any 1 out of 2) **3**

(1) Explain continuity equation in electrodynamics.

(2) Discuss Maxwell's modification in Ampere's law.

(d) Answer in detail : (any 1 out of 2) **5**

(1) Explain Poynting's theorem.

(2) Discuss "Energy in magnetic field".

3 (a) Answer the following questions : (one mark each) **4**

(1) What is wave ?

(2) Complex wave function is given by _____.

(3) $\left(\frac{\partial f}{\partial z}\right)_{z=0^-} = \left(\frac{\partial f}{\partial z}\right)_{z=0^+}$ is called ____ for reflection and transmission waves.

(4) What is transverse waves ?

(b) Answer in brief : (any 1 out of 2) **2**

(1) Explain complex notation for wave equation.

(2) Amplitude A_3 is given by $A_3\, e^{i\delta 3} = A_1 e^{i\delta 1} + A_2 e^{i\delta 2}$. Determine A_3.

(c) Answer the following questions : (any 1 out of 2) **3**

(1) Deduce the equation for E and B in vacuum.

(2) Discuss polarization of wave.

(d) Answer in detail : (any 1 out of 2) **5**

(1) Formulate wave equation for stretched string.

(2) Formulate wave equation for sinusoidal wave.

4 (a) Answer following questions : (1 mark of each) **4**

(1) Write the names of two types of emission spectra.

(2) The dark lines of Sun's absorption spectra is called _____.

(3) Frank Hertz's experiment gives confirmation that electron occupied ____ energy level.

(4) Bohr's theory of atomic model also predicts about the intensity of spectral line. (True or false)

(b) Answer in brief : (any 1 out of 2) **2**

(1) Calculate the wavelength of light emitted by an atom, excited to higher state by applying 2V.

(2) Under uniform magnetic field of 4 Webbers/metere^2; find Δv for normal Zeeman splitting.

(c) Answer the following questions: (any 1 out of 2) **3**

(1) Explain continuous spectra.

(2) Explain Paschen-back effect.

(d) Answer in detail : (any 1 out of 2) **5**

(1) Explain Bohr's theory. (Postulates only)

(2) Explain Frank-Hertz's experiment.

5 (a) Answer the following questions : (1 mark each) **4**

(1) Frequency difference between incident radiation and scattered radiation from molecule is called _____.

(2) For Stokes lines, Δv is negative. (True/false)

(3) Write the range of intensity of Raman scattered light, with respect to intensity of incident light.

(4) On both side of exciting line in Raman spectra, we can observe equidistance lines, that is pure rotational spectra. (true or false)

(b) Answer in brief : (any 1 out of 2) **2**

(1) Vibration transmission occurs with energy change of 1.6×10^{-20} erg/mol, calculate the frequency of radiation.

(2) In rotational spectrum of CO gas, the spacing is observed between the spectral line is 3.84 cm^{-1}. Calculate the moment of inertia of CO molecule.

(c) Answer the following questions : (any 1 out of 2) **3**

(1) Give the difference between Raman spectra and Fluorescence spectra.

(2) Give the brief review on radiation source of experimental set up of Raman effect.

(d) Answer in detail : (any 1 out of 2) **5**

(1) Discuss salient feature of Raman effect.

(2) Explain pure rotational spectra.