Seat No. _____

HAL-003-1013002

B. Sc. (Sem.-III) (CBCS)
(W.E.F. 2016) Examination
June - 2023
Physics : 301
(Elec./ Magne. / Semi.) (Old Course)

Faculty Code : 003
Subject Code : 1013002

Time : **2½** Hours / Total Marks : **70**

Instructions : (1) All questions are compulsory.

(2) Symbols have their usual meaning.

(3) Figures on right side indicate marks.

1 (A) Give answer in short: **4**

(1) Define Scalar quantity.

(2) Name any two scalar physical quantities.

(3) Define vector product of two vectors.

(4) Define curl.

(B) Answer any one question: **2**

(1) Calculate the divergence of $A = x^2 i + 3xz^2 j - 2xzk$

(2) If $\vec{A} = \vec{A}xi + \vec{A}yj + \vec{A}zk$ then find $\left|\vec{A}\right|$

(C) Answer any one question: **3**

(1) Prove that divergence of curl is always zero, check it for V=xyi+2yzj+3zxk.

(2) Write properties of scalar product.

(D) Answer any one question: **5**

(1) State and explain fundamental theorem of Curl

(2) State and explain fundamental theorem of Divergence.

2 (A) Give answer in short : 4

(1) What is the charge of an electron?

(2) What is the unit of electric field?

(3) Define linear charge density.

(4) The unit $C^2 / N.M^2$ is the unit of _____.

(B) Answer any one question: 2

(1) At a point in electric field a charge of 5×10^{-4} coulomb experience a force of 2.25N, calculate the intensity of electric field at that point.

(2) The potential due to an isolated point charge at appoint 20cm from the charge is 400 volt calculate the magnitude of the charge.

(C) Answer any one question: 3

(1) Explain Poisson' and Laplace equation.

(2) Explain the properties of electric field line.

(D) Answer any one question: 5

(1) In continuous charge distributions explain the following charge distributions.

(i) Linear charge distributions

(ii) Volume charge distribution

(2) Explain electric field around uniformly charged spherical shell.

3 (A) Give answer in short: 4

(1) The potential energy of charge particles remain constant when it moves in magnetic field. True or False.

(2) What is called steady current?

(3) What is the value of μ_0 which appear in Bio Savart law?

(4) Magnetic field is vector quantity. True or False.

(B) Answer any one question: 2

(1) A straight wire of mass 200 g and length 1.5m carries a current of 0.2A. It is suspended in mid air by a uniform horizontal magnetic field B.What is the magnitude of magnetic field?

(2) Calculate the magnitude of the magnetic field due to long thin wire carrying current of 15 Amp at a distance of 1 cm from the wire. $\mu_0 = 4\pi \times 10^{-7}$

(C) Answer any one question: 3
   (1) To find the magnetic field inside the Toroid using Ampere's circuital law.
   (2) A long wire carries a current of 5 mA. Find the line integral of B arround the path of radius 10cm enclosing the wire.

(D) Answer any one question: 5
   (1) State Bio Savart law and derive a magnetic field at a distance x from the centre of a circular loop of radius which carries a steady current I
   (2) State Bio Savart law and derive the magnetic field at a distance R from a long straight wire carrying a steady current I.

4 (A) Give answer in short: 4
   (1) What is dielectrics ?
   (2) Define dipoles.
   (3) What are the non polar molecules?
   (4) What is the unit of magnetic field ?

(B) Answer any one question: 2
   (1) Explain about induced dipoles.
   (2) Explain polarizability of a dielectric material.

(C) Answer any one question: 3
   (1) Explain paramagnetic and diamagnetic
   (2) Obtain expression for torque acting on a dipole in a magnetic field.

(D) Answer any one question: 5
   (1) Explain the effect of magnetic field on atomic orbit with necessary equations.
   (2) Explain susceptibility, permittivity and dielectric constant.

5 (A) Give answer in short: **4**

      (1) Define single stage transistor amplifier.

      (2) What is dc load line?

      (3) The phase difference between input voltage and output voltage in CE amplifier is _____.

      (4) What is the function of by pass capacitor in transistor amplifier?

   (B) Answer any one question: **2**

      (1) For the transistor amplifier having

$R_c = 2K\Omega, R_L = 1K\Omega, R_{in} = 1K\Omega$ and $\beta = 80$.

Find the voltage gain.

      (2) If in transistor configuration the value of $\alpha = 0.98$, what would be the value of β?

   (C) Answer any one question: **3**

      (1) Explain phase reversal in CE configuration.

      (2) Explain operating point of transistor.

   (D) Answer any one question: **5**

      (1) Explain practical circuit of transistor amplifier.

      (2) Explain voltage divider bias method.

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