Quarterly Examination 2018-2019

Physics

Class : XII

Time : 3 hrs.+15min. **Full Marks : 70**

SECTION-A

Question-1 **[1x5]**

(A) Choose the correct alternative.

(i) The SI unit of free space permittivity (ϵ_o) is

(a) Nm^2c^{-2} (b) $Nm^{-2}c^2$

(c) $N^{-1}m^2c^{-2}$ (d) $N^{-1}m^2c^{-2}$

(ii) An electric dipole of dipole moment $\vec{P}$ is placed in a uniform electric field $\vec{E}$. Its potential energy can be given as.

(a) $U = \vec{P} \times \vec{E}$ (b) $U = \vec{P} \cdot \vec{E}$

(c) $U = -\vec{P} \cdot \vec{E}$ (d) $U = -\vec{P} \times \vec{E}$

(iii) The factor which do not affect the capacity of a capacitor is

(a) shape of the plates

(b) distance between the plates

(c) potential difference between the plates

(d) Nature of medium between the plates.

(iv) The drift velocity of the free electrons in a conducting wire carrying current i is v. If in a wire of the same metal, but of double the radius the current be 2i, then the drift velocity of electrons will be.

(a) $\frac{v}{4}$ (b) $\frac{v}{2}$

(c) v (d) $4v$

{Turn Over}

(v) At a place the angle of dip is 30^{O}. If the horizontal component of earth's magnetic field is B_H. The net magnetic field at this place is

(a) $\frac{B_H}{2}$ (b) $\frac{2B_H}{\sqrt{3}}$

(c) $\sqrt{2}\,B_H$ (d) $\sqrt{3}B_H$

(B) Answer the following questions. Your answer should be brief and to the point. [1x7]

(i) The order of coloured rings in a carbon resistor is red, Yellow, blue and silver. Then what should be resistance of carbon resistor ?

(ii) A charge of 2 μc is kept inside a cube of side 1 m. What is the flux through any face of the cube ?

(iii) A capacitor is charged by a cell of emf 'E' & then cell is removed. Now a dielectric medium is inserted inside it. What is the effect on potential difference & energy stored over capacitor.

(iv) For what orientation of electric dipole with respect to an electric field work done is maximum. What should be its value ?

(v) Give the vector form of ohm's law.

(vi) If P, Q, R and S the resistances of a wheatstone's bridge are 4Ω, 6Ω, 8Ω and 20Ω respectively. What resistance should be added to 'S' to balance the bridge.

(vii) A part of an electric circuit is shown in the figure below. Find the current through 4Ω resistor.

What is shunt. for what purpose it is used Derive Ohm's law with the help of drift velocity. On what basic factors the specific resistance of conductor depends.

Q21. What do you mean by magnetic field strength at a point in magnetic field. Give its SI unit. Derive the formula for field strength due to a short magnet in axial position. [5]

OR

Define magnetic hysteresis. Why it is taken as demerit. Explain with example. Derive a relation between Magnetic susceptibility & magnetic relative permeability.

{Turn Over}

OR

(i) Explain Curie's law for ferromagnetic substance what is the effect of temperature on susceptibility of a paramagnetic substance.

(ii) A rectangular coil having 60 turns and area $0.4m^2$ is held at right angles to a uniform magnetic field of strength $5x10^{-5}T$. Calculate the magnetic flux passing through it.

Section—D

Q18. State & prove Gauss's theorem. How can you derive coulomb's law with Gauss's theorem. [5]

Or

Define electric intensity at a point in electric field. Find the intensity at the centre of a semicircular ring whose upper half is +ve ly charged & lower half is negatively charge with charge per unit length 'λ'.

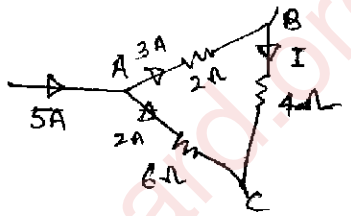
Q19. Why two equipotential surfaces do not intersect each other. Apply Gauss's theorem to find intensity at a point to a uniformly charged cylindrical conductor. [5]

OR

Find the expression for energy stored on a capacitor. Prove the there is loss in electrical energy when there is exchange of charges between two charged conductors.

Q20. State and explain Kirchoff's law for electrical circuit. How can you apply it to find the balanced condition of Wheatstone's bridge. [5]

OR



Section—B

(Answer all questions)

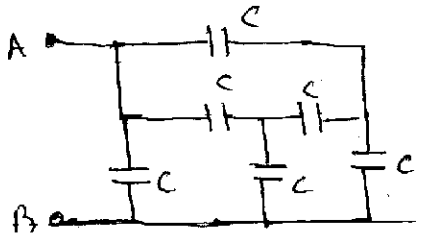
Q2. Define current density. Write an expression which connects current density with drift speed. [3]

Q3. What is electric flux. Give its unit and dimension. [3]

Q4. The electric field strength at a point on the axis of a dipole is 2x104 N/C. If the dipole is turned by an angle of 90^{O} at its own place what is the intensity at the same point. Explain with suitable formula.

OR

Find the effective capacity between A & B in the given circuit.



Q5. A given length of a conductor having rectangular cross-section has a resistance 'R' If every linear dimension were halved. What would be its new resistance.

Q6. Three charges each of 2μc kept at the vertices of an equilateral triangle of side 1m. Find the potential energy of this system of charges in eV. [2]

{Turn Over}

Q7. What do you mean by equipotential surface Mention at least two important properties of it. [2]

Q8. Find the resistivity of a conductor in which a current density of 2.5 Am^{-2} is found to exist, when an electric field of 1.5 vm^{-1} is applied on it. Explain the factors on which resistivity depends. [2]

Q9. The maximum working voltage for a capacitor X is 3kv and for the capacitor Y is 4KV If the capacitance of x and y are 2μf and 1μf respectively : what maximum voltage can be applied across the series combination of these capacitors ?

Q10. A water tap is maintained a constant potential 'V' from which water drop of radius 'r' is falling into a spherical vessel of radius 'R'. When the vessel is completely filled. Find its potential.

Q11. What is magnetic moment. A magnetic wire with magnetic moment M is bent is the form of a semicircle what is its nest magnetic moment.

OR

What do you understand by neutral pt. How many neutral point will you expect when a magnet with its north pole except in geographical South. Explain with diagram.

Section—C

Q12. Obtain an expression for electric intensity at a point in end on position i.e. axial position of an electric dipole.

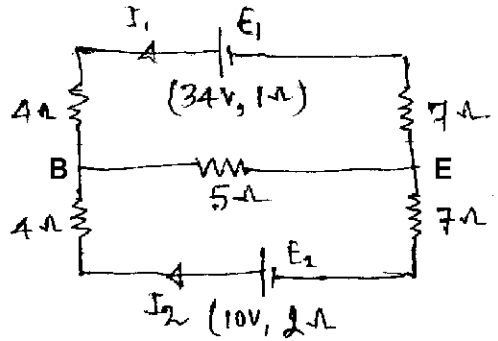
Q13. What do you mean by electric potential at a point in an electric field ? Obtain an expression for electric potential at a point due to point charge.

Q14. Deduce an expression for equivalent capacitance 'C' when three capacitors C_1, C_2 and C_3 are connected in (i) series (ii) parallel

OR

Find the capacity of a parallel plate capacitor with the introduction of dielectric slab between the plates of the capacitor.

Q15. E_1 and E_2 are two batteries having emf of 34V and 10V respectively and internal resistance of 1Ω and 2Ω respectively as shown in fig. Using Kirchoff's laws, calculate the current I_1 & I_2 & potential difference between B & E.



Q16. An electric bulb is marked as (200V, 100W) Calculate electrical resistance of its filament. If five such bulbs are connected in series to a 200V supply. How much current will flow through them ? [3]

Q17. Define dip at a place. If apparent dip at a place in known the how can you find true dip at that place. [3]

{Turn Over}