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	Term 1	Term 2	Term 3	Periodical Test	SLAS	

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	Term 1	Term 2	Term 3	Periodical Test	SLAS	

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UNIT – 1 : ONE MARK ANSWER

1. Which charge configuration produces a uniform electric field?
   (a) point charge
   (b) uniformly charged infinite line
   (c) uniformly charged infinite plane
   (d) uniformly charged spherical shell
2. An electric dipole is placed at an alignment angle of 30^0 with an electric field of 2×10^5 N C^{-1}. It experiences a torque equal to 8 N m. The charge on the dipole if the dipole length is 1 cm is
   (a) 4 mC **(b) 8 mC** (c) 5 mC (d) 7 mC
3. Two identical conducting balls having positive charges q_1 and q_2 are separated by a centre to centre distance r. If they are made to touch each other and then separated to the same distance, the force between them will be
   (a) less than before (b) same as before **(c) more than before** (d) zero
4. Two points A and B are maintained at a potential of 7 V and -4 V respectively. The work done in moving 50 electrons from A to B is
   (a) 8.80×10^{-17} J (b) -8.80×10^{-17} J (c) 4.40×10^{-17} J (d) 5.80×10^{-17} J
5. If voltage applied on a capacitor is increased from V to 2V, choose the correct conclusion.
   (a) Q remains the same, C is doubled (b) Q is doubled, C doubled
   (c) C remains same, Q doubled (d) Both Q and C remain same
6. Parallel plate capacitor stores a charge Q at a voltage V. Suppose the area of the Parallel plate capacitor and the distance between the plates are each doubled then which is the quantity that will change?
   (a) Capacitance (b) Charge (c) Voltage **(d) Energy density**
7. Two metallic spheres of radii 1 cm and 3 cm are given charges of -1×10^{-2} C and 5×10^{-2} C respectively. If these are connected by a conducting wire, the final charge on the bigger sphere is
   (a) 3×10^{-2} C (b) 4×10^{-2} C (c) 1×10^{-2} C (d) 2×10^{-2} C
8. When the charge given to a capacitor is doubled, its capacitance
   (a) increases twice (b) decreases twice (c) increases four times
   (d) does not change

9. For which of the following medium, the value of relative permittivity is 1

(a) Mica **(b) Air** (c) Glass (d) Water

10. An electric dipole of dipole moment 'p' is kept parallel to an electric field of intensity 'E'. The work done in rotating the dipole through an angle of 90^0 is :

a) zero b) –PE **c) PE** d) 2PE

11. The intensity of electric field at a point is equal to

a) the force experienced by a charge q

b) the work done in bringing unit positive charge from infinity to that point

c) the positive gradient of the potential

d) the negative gradient of the potential

12. The ratio of electric potential at points 10 cm and 20 cm from the centre of an electric dipole along its axial line is

a) 1 : 2 b) 2 : 1 c) 1:4 **d) 4 : 1**

13. The unit of molecular polarisability is

(a) $C^2N^{-1}m$ (b) Nm^2C^{-1} (c) $N^{-1}m^{-2}C^2$ (d) $C^{-1}m^2$

14. A capacitor of capacitance 6 μF is connected to a 100 V battery. The energy stored in the capacitor is

a) 30 J b) 3J **c) 0.03 J** d) 0.06 J

15. The law that governs the force between electric charges is

a) Ampere's law b) Faraday's law **c) Coulomb's law** d) Ohm's law

UNIT – 2 : ONE MARK ANSWER

1. Compute the current in the wire if a charge of 180 C is flowing through a copper wire in 60 seconds.

   (a) 3 A (b) 5A (c) 180A (d) 60A

2. A toaster operating at 240V has a resistance of 120 Ω. The power is

   (a) 240W (b) 400W (c) 2W **(d) 480W**

3. The resistivity of a wire

   (a) varies with it's a wire` (b) varies with in mass

   (c) varies with its cross section

   (d) Does not depend on its length, cross section and mass

4. Which of the following has negative temperature coefficient of resistance?

   (a) Cu (b) Al **(c) Ge** (d) Fe

5. The resistance of an ideal ammeter is

   (a) **zero** (b) small (c) high (d) infinite

6. A carbon resistance has colour bands in order Yellow, Brown , Red its resistance is

   (a) 41 Ω (b) 4×10^3 Ω **(c) 41×10^2 Ω** (d) 4.2 Ω

7. The resistance of a material increase with temperature. it is a

   (a) metal (b) insulator (c) semi conductor (d) semi - metal

8. The reciprocal of resistance is

   (a) **conductance** (b) resistivity (c) conductivity (d) none

9. n equal resistors are first connected in series and then in parallel. The ratio of the equivalent resistance in two cases is

   (a) n (b) $\frac{1}{n^2}$ **(c) n^2** (d) $\frac{1}{n}$

10. A cell has an emf of 15V. When short circuited, it gives a current of 3A. The internal resistance of the cell is

    (a) 3 Ω (b) 0.3 Ω (c) 0.2 Ω **(d) 5 Ω**

11. If the length of a wire is doubled and its cross - section is also doubled, then its resistance will

(a) becomes 4 times (b) becomes $\frac{1}{4}$ times

(c) becomes 2 times **(d) remain unchanged**

12. In India electricity is supplied for domestic use at 220V. It is supplied at 110V in USA. If the resistance of a 60W bulb for use in India is R, the resistance of a 60W bulb for use in USA will be

(a) R (b) 2R **(c) $\frac{R}{4}$** (d) $\frac{R}{2}$

13. The temperature coefficient of resistance of a wire is 0.00125per^{0}C. At 20^{0}C, its resistance is 1 Ω. The resistance of the wire will be 2 Ω at

(a) 800^{0}C (b) 700^{0}C **(c) 820^{0}C** (d) 850^{0}C

14. The internal resistance of a 2.1 V cell which gives a current of 0.2 A through a resistance of 10 Ω

(a) 0.2 Ω (b) 0.8 Ω (c) 1 Ω **(d) 0.5 Ω**

15. In Joule's heating law, when R and t are constant, if the H is taken along the y axis and I^2 along the x axis , the graph is

(a) straight line (b) parabola (c) circle (d) ellipse

UNIT – 3 : ONE MARK ANSWER

1. The force experienced by a particle having mass m and charge q accelerated through a potential difference V when it is kept under perpendicular magnetic field $\vec{B}$ is

(a) $\sqrt{\frac{2q^3BV}{m}}$ (b) $\sqrt{\frac{q^3B^2V}{2m}}$ **(c)** $\sqrt{\frac{\mathbf{2q^3B^2V}}{\mathbf{m}}}$ (d) $\sqrt{\frac{2q^3BV}{m^3}}$

2. A circular coil of radius 5 cm and 50 turns carries a current of 3 ampere. The magnetic dipole moment of the coil is

(a) 1.0 amp – m^2 **(b) 1.2 amp – m^2** (c) 0.5 amp – m^2 (d) 0.8 amp – m^2

3. A wire of length *l* carries a current I along the Y direction and magnetic field is given by $\vec{B} = \frac{\beta}{\sqrt{3}}(\vec{i} + \vec{j} + \vec{k})T$. The magnitude of Lorentz force acting on the wire is

a) $\sqrt{\frac{\mathbf{2}}{\sqrt{\mathbf{3}}}}$ **βI*l*** b) $\sqrt{\frac{1}{\sqrt{3}}}$ βI*l* c) $\sqrt{2}$ βI*l* d) $\sqrt{\frac{1}{\sqrt{2}}}$ βI*l*

4. A simple pendulum with charged bob is oscillating with time period T and let θ be the angular displacement. If the uniform magnetic field is switched ON in a direction perpendicular to the plane of oscillation then

(a) time period will decrease but θ will remain constant

(b) time period remain constant but θ will decrease

(c) both T and θ will remain the same

(d) both T and θ will decrease

5. The vertical component of Earth's magnetic field at a place is equal to the horizontal component. What is the value of angle of dip at this place?

(a) 30^o **(b) 45^o** (c) 60^o (d) 90^o

6. A non-conducting charged ring of charge q, mass m and radius r is rotated with constant angular speed ω. Find the ratio of its magnetic moment with angular momentum is

(a) $\frac{q}{m}$ (b) $\frac{\mathbf{2q}}{\mathbf{m}}$ (c) $\frac{q}{2m}$ (d) $\frac{q}{4m}$

7. Three wires of equal lengths are bent in the form of loops. One of the loops is circle, another is a semi-circle and the third one is a square. They are placed in a uniform magnetic field and same electric current is passed through them. Which of the following loop configuration will experience greater torque?

(a) circle (b) semi-circle c) square (d) all of them

8. The SI unit of pole strength is

(a) Am (b) Am^2 (c) Am^{-2} (d) Am^{-1}

9. The relative permeability of a paramagnetic material is

(a) greater than unity (b) less than unity (c) equal to unity (d) negative

10. When a charged particle enters a uniform magnetic field its kinetic energy

(a) **remains constant** (b) increase (c) decrease (d) becomes zero

11. At curie point, a ferromagnetic material becomes

(b) Non magnetic (b) diamagnetic

(c) paramagnetic (d) anti ferromagnetic

12. Relative permeability of iron is 5500. Its magnetic susceptibility is

(b) 5501 (b) 5500×10^{-7} **(c) 5499** (d) 5500×10^{7}

13. A moving charge produces

(b) An electric field only (b) a magnetic field only

(c) neither an electric nor a magnetic field

(d) both electric and magnetic fields

14. In a moving coil galvanometer the current '*i*' is related to the deflection θ is

(a) $\mathbf{i \propto \theta}$ (b) $i \propto \tan\theta$ (c) $i \propto \theta^2$ (d) $i \propto \sqrt{\theta}$

15. A circular loop of area $0.01m^2$ and carrying a current of 10A is placed parallel to a magnetic field of intensity 0.1T. the torque acting on the loop, in Nm is

(a) 0.8 (b) 0.001 **(c) 0.01** (d) 1.1

UNIT – 4 : ONE MARK ANSWER

01. The flux linked with a coil at any instant t is given by $\emptyset_B = 10t^2 - 50t+250$. The induced emf at t = 3s is

(a) −190 *V* **(b) −10 *V*** (c) 10 *V* (d) 190 *V*

02. When the current changes from +2A to −2A in 0.05 s, an emf of 8 V is induced in a coil. The co-efficient of self-induction of the coil is

(a) 0.2 H (b) 0.4 H (c) 0.8 H **(d) 0.1 H**

03. In a transformer, the number of turns in the primary and the secondary are 410 and 1230 respectively. If the current in primary is 6A, then that in the secondary coil is

(a) 2 A (b) 18 A (c) 12 A (d) 1 A

04. A step-down transformer reduces the supply voltage from 220 V to 11 V and increase the current from 6 A to 100 A. Then its efficiency is

(a) 1.2 **(b) 0.83** (c) 0.12 (d) 0.9

05. In a series resonant *RLC* circuit, the voltage across 100 Ω resistors is 40 V. The resonant frequency ω is 250 rad/s. If the value of C is 4μF,then the voltage across L is

(a) 600 V (b) 4000 V **(c) 400V** (d) 1 V

06. An inductor 20 mH, a capacitor 50 μF and a resistor 40 Ω are connected in series across a source of emf v = 10 sin 340 t. The power loss in AC circuit is

(a) 0.76 W (b) 0.89 W **(c) 0.46 W** (d) 0.67 W

07. The instantaneous values of alternating current and voltage in a circuit are $i = \frac{1}{\sqrt{2}} \sin(100\pi t)$ A and $v = \frac{1}{\sqrt{2}} \sin(100\pi t + \frac{\pi}{3})$ V. The average power in watts consumed in the circuit is

(a) $\frac{1}{4}$ (b) $\frac{\sqrt{3}}{4}$ (c) $\frac{1}{2}$ **(d) $\frac{1}{8}$**

08. In an oscillating LC circuit, the maximum charge on the capacitor is Q. The charge on the capacitor when the energy is stored equally between the electric and magnetic fields is

(a) $\frac{Q}{2}$ (b) $\frac{Q}{\sqrt{3}}$ **(c) $\frac{Q}{\sqrt{2}}$** (d) Q

09. The inductance of a coil is proportional to

(a) its length (b) the number of turns

(c) square of the number of turns (d) the resistance of the coil

10. Faraday's law of electromagnetic induction is related to the

(a) Third law of motion **(b) Law of conservation of energy**

(c) Law of conservation of charge

(d) Law of conservation of angular momentum

11. An emf of 5V is induced in an inductance when the current in it changes at a steady rate from 3A to 2A in 1 millisecond. The value of inductance is

(a) 5mH (b) 5H (c) 5000H (d) zero

12. A coil of cross sectional area 400 cm^2 having 30 turns is making 1800 rev / min in a magnetic field of 1T, the peak value of the induced emf is

(a) 113 V **(b) 226 V** (c) 339 V (d) 452 V

13. The core of a transformer is laminated to reduce

(a) Copper loss (b) Magnetic loss **(c) Eddy current loss** (d) Hysteresis loss

14. In s series RLC circuit R = 10 Ω and the impedance Z = 20 Ω. Then the phase difference between the current and the voltage is

(a) 60^0 (b) 30^0 (c) 45^0 (d) 90^0

15. Quantity that remains unchanged in a transformer is

(a) Voltage (b) current **(c) frequency** (d) none of these

UNIT – 5 : ONE MARKS ANSWER

01. The dimension of $\frac{1}{\mu_0 \varepsilon_0}$ is

(a) $[L\ T^{-1}]$ **(b) $[L^2\ T^{-2}]$** (c) $[L^{-1}\ T]$ (d) $[L^{-2}\ T^2]$

02. If the amplitude of the magnetic fi eld is 3×10^{-6} T, then amplitude of the electric

field for a electromagnetic waves is

(a) 100 V m^{-1} (b) 300 V m^{-1} (c) 600 V m^{-1} **(d) 900 V m^{-1}**

03. Which of the following electromagnetic radiation is used for viewing objects through fog

(a) microwave (b) gamma rays (c) X- rays **(d) infrared**

04. Which of the following are false for electromagnetic waves

(a) transverse (b) mechanical waves

(c) longitudinal (d) produced by accelerating charges

05. Let $E = E_o \sin[10^6 x - \omega t]$ be the electric field of plane electromagnetic wave, the value of ω is

(a) 0.3×10^{-14}rad s^{-1} (b) 3×10^{-14}rad s^{-1}

(c) 0.3×10^{14} rad s^{-1} **(d) 3×10^{14} rad s^{-1}**

06. Which of the following is NOT true for electromagnetic waves?.

(a) it transport energy (b) it transport momentum

(c) it transport angular momentum

(d) in vacuum, it travels with different speeds which depend on their frequency

07. The electric and magnetic fields of an electromagnetic wave are

(a) in phase and perpendicular to each other

(b) out of phase and not perpendicular to each other

(c) in phase and not perpendicular to each other

(d) out of phase and perpendicular to each other

08. If the magnetic monopole exists, then which of the Maxwell's equation to be modified?.

(a) $\oint \vec{E}.d\vec{A} = \frac{Q_{enclosed}}{\varepsilon_0}$ **(b) $\oint \vec{E}.d\vec{A} = 0$**

(c) $\oint \vec{E}.d\vec{A} = \mu_0 I_{enclosed} + \mu_0\varepsilon_0 \frac{d}{dt}\int \vec{E}.d\vec{A}$ (d) $\vec{E}.d\vec{l} = -k\frac{d}{dt}\phi_B$

09. Frequency of a wave is $6x10^{15}$Hz. The wave is

(a) Radio wave (b) Microwave (c) X – ray **(d) UV rays**

10. Which of the following has maximum frequency?

(a) X – Rays (b) IR Rays (c) UV Rays (d) Radio waves

11. Electromagnetic radiation of frequency $3x10^5$ MHz lies in the

(a) Radio wave region (b) Visible region (c) IR region **(d) Microwave region**

12. Consider an electric charge oscillating with frequency of 10MHz. the radiation emitted will have a wavelength equal to

(a) 20m **(b) 30m** (c) 40m (d) 10m

13. The frequencies of X – rays , γ - rays and UV rays are respectively a, b and c. Then

(a) a < b, b < c **(b) a < b, b > c** (c) a > b, b > c (d) a > b, b < c

14. In an electromagnetic wave the electric field vector $\vec{E}$ and magnetic field vector $\vec{B}$ are

(a) Perpendicular to each other (b) parallel to each other

(c) at 45^0 to each other (d) can have any angle between them

15. TV waves have a wavelength range of 1 – 10 metre. Their frequency range in MHz is

(a) 300 – 3000 (b) 3 – 3000 **(c) 30 – 300** (d) 3 – 30

PART – III

இயற்பியல் / PHYSICS

Time Allowed : 3:00 Hours] [Maximum Marks : 70

Instructions :

(1) Check the question paper for fairness of printing. If there is any lack of fairness, inform the Hall Supervisor immediately.

(2) Use Blue or Black ink to write and underline and pencil to draw diagrams.

PART – I

Note : (i) Answer **all** the questions. 15x1=15

(ii) Choose the most appropriate answer from the given four alternatives and write the option code and the corresponding answer.

1. Which charge configuration produces a uniform electric field?
   (a) Point charge
   (b) Uniformly charged infinite line
   (c) Uniformly charged infinite plane
   (d) Uniformly charged spherical shell
2. An electric dipole is placed at an alignment angle of 30^0 with an electric field of 2×10^5 N C^{-1}. It experiences a torque equal to 8 N m. The charge on the dipole if the dipole length is 1 cm is
   (a) 4 mC (b) 8 mC (c) 5 mC (d) 7 mC
3. Two identical conducting balls having positive charges q_1 and q_2 are separated by a centre to centre distance r. If they are made to touch each other and then separated to the same distance, the force between them will be
   (a) less than before (b) same as before (c) more than before (d) zero
4. Two points A and B are maintained at a potential of 7 V and -4 V respectively. The work done in moving 50 electrons from A to B is
   (a) 8.80×10^{-17} J (b) -8.80×10^{-17} J (c) 4.40×10^{-17} J (d) 5.80×10^{-17} J
5. If voltage applied on a capacitor is increased from V to 2V, choose the correct conclusion.
   (a) Q remains the same, C is doubled (b) Q is doubled, C doubled
   (c) C remains same, Q doubled (d) Both Q and C remain same

6. Parallel plate capacitor stores a charge Q at a voltage V. Suppose the area of the Parallel plate capacitor and the distance between the plates are each doubled then which is the quantity that will change?
   (a) Capacitance (b) Charge (c) Voltage (d) Energy density
7. Two metallic spheres of radii 1 cm and 3 cm are given charges of -1×10^{-2} C and 5×10^{-2} C respectively. If these are connected by a conducting wire, the final charge on the bigger sphere is
   (a) 3×10^{-2} C (b) 4×10^{-2} C (c) 1×10^{-2} C (d) 2×10^{-2} C
8. When the charge given to a capacitor is doubled, its capacitance
   (a) increases twice (b) decreases twice (c) increases four times
   (d) does not change
9. For which of the following medium, the value of relative permittivity is 1
   (a) Mica (b) Air (c) Glass (d) Water
10. An electric dipole of dipole moment 'p' is kept parallel to an electric field of intensity 'E'. The work done in rotating the dipole through an angle of 90^0 is :
    a) zero b) –PE c) PE d) 2PE
11. The intensity of electric field at a point is equal to
    a) the force experienced by a charge q
    b) the work done in bringing unit positive charge from infinity to that point
    c) the positive gradient of the potential
    d) the negative gradient of the potential
12. The ratio of electric potential at points 10 cm and 20 cm from the centre of an electric dipole along its axial line is
    a) 1 : 2 b) 2 : 1 c) 1:4 d) 4 : 1
13. The unit of molecular polarisability is
    (a) $C^2N^{-1}m$ (b) Nm^2C^{-1} (c) $N^{-1}m^{-2}C^2$ (d) $C^{-1}m^2$
14. A capacitor of capacitance 6 μF is connected to a 100 V battery. The energy stored in the capacitor is
    a) 30 J b) 3J c) 0.03 J d) 0.06 J
15. The law that governs the force between electric charges is
    a) Ampere's law b) Faraday's law c) Coulomb's law d) Ohm's law

PART – II

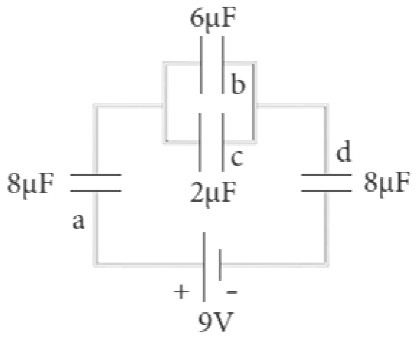
Answer **any six** of the following questions. Q. No. **24 is compulsory** 6x2=12

16. State Coulomb's law in electrostatics.
17. Define one coulomb (1 C)
18. What is called electric dipole? Give an example.
19. Define electric dipole moment. Give its unit.
20. Define electric flux and their unit.
21. During lightning, it is safer to sit inside bus than in an open ground or under tree. Why?
22. Define action of point or corona discharge.
23. Distinguish between Polar molecules and Non - Polar molecules.
24. A sample of HCl gas is placed in a uniform electric field of magnitude 3×10^{4} NC^{-1}. The dipole moment of each HCl molecule is 3.4×10^{-30} Cm. Calculate the maximum torque experienced by each HCl molecule.

PART – III

Answer **any six** of the following questions. Q. No. **33 is compulsory** 6x3=18

25. Discuss the basic properties of electric charge.
26. List the properties of electric field lines.
27. Derive an expression for torque experienced by an electric dipole placed in the uniform electric field.
28. Derive an expression for capacitance of parallel plate capacitor.
29. Derive an expression for energy stored in capacitor
30. Dielectric strength of air is 3×10^{6} V m^{-1}. Suppose the radius of a hollow sphere in the Van de Graff generator is R = 0.5 m, calculate the maximum potential difference created by this Van de Graaff generator.
31. Give the applications and disadvantage of capacitors.
32. Explain in detail how charges are distributed in a conductor and the principle behind the lightning conductor.
33. For the given capacitor configuration (a) Find the charges on each capacitor (b) potential difference across them (c) energy stored in each capacitor



PART – IV

Answer **all** the questions. 5x5=25

34. Explain in detail Coulomb's law and its various aspects.

(OR)

Calculate the electric field due to a dipole on its axial line.

35. Calculate the electric field due to a dipole on its equatorial line.

(OR)

Obtain an expression for electric field due to an infinitely long charged wire.

36. Derive an expression for electro static potential due to electric dipole.

(OR)

Obtain an expression for electric field due to an infinitely long charged wire.

37. Explain in detail the effect of dielectric placed in a parallel plate capacitor when the capacitor is disconnected from the battery.

(OR)

Derive the expression for resultant capacitance, when capacitors are connected in series and in parallel.

38. Explain in detail the construction and working of Van de Graff generator.

(OR)

Obtain an expression for electric field due to an uniformly charged spherical shell.

-OOO-

PART – III

இயற்பியல் / PHYSICS

Time Allowed : 3:00 Hours] [Maximum Marks : 70

Instructions :

(1) Check the question paper for fairness of printing. If there is any lack of fairness, inform the Hall Supervisor immediately.

(2) Use Blue or Black ink to write and underline and pencil to draw diagrams.

PART – I

Note : (i) Answer **all** the questions. 15x1=15

(ii) Choose the most appropriate answer from the given four alternatives and write the option code and the corresponding answer.

1. Compute the current in the wire if a charge of 180 C is flowing through a copper wire in 60 seconds.
   (a) 3 A (b) 5A (c) 180A (d) 60A
2. A toaster operating at 240V has a resistance of 120 Ω. The power is
   (a) 240W (b) 400W (c) 2W (d) 480W
3. The resistivity of a wire
   (a) varies with it's a wire` (b) varies with in mass
   (c) varies with its cross section
   (d) Does not depend on its length, cross section and mass
4. Which of the following has negative temperature coefficient of resistance?
   (a) Cu (b) Al (c) Ge (d) Fe
5. The resistance of an ideal ammeter is
   (a) zero (b) small (c) high (d) infinite
6. A carbon resistance has colour bands in order Yellow, Brown , Red its resistance is
   (a) 41 Ω (b) 4×10^3 Ω (c) 41×10^2 Ω (d) 4.2 Ω
7. The resistance of a material increase with temperature. it is a
   (a) metal (b) insulator (c) semi conductor (d) semi - metal

8. The reciprocal of resistance is

(a) conductance (b) resistivity (c) conductivity (d) none

9. n equal resistors are first connected in series and then in parallel. The ratio of the equivalent resistance in two cases is

(a) n (b) $\frac{1}{n^2}$ (c) n^2 (d) $\frac{1}{n}$

10. A cell has an emf of 15V. When short circuited, it gives a current of 3A. The internal resistance of the cell is

(a) 3 Ω (b) 0.3 Ω (c) 0.2 Ω (d) 5 Ω

11. If the length of a wire is doubled and its cross - section is also doubled, then its resistance will

(a) becomes 4 times (b) becomes $\frac{1}{4}$ times

(c) becomes 2 times (d) remain unchanged

12. In India electricity is supplied for domestic use at 220V. It is supplied at 110V in USA. If the resistance of a 60W bulb for use in India is R, the resistance of a 60W bulb for use in USA will be

(a) R (b) 2R (c) $\frac{R}{4}$ (d) $\frac{R}{2}$

13. The temperature coefficient of resistance of a wire is 0.00125per^{0}C. At 20^{0}C, its resistance is 1 Ω. The resistance of the wire will be 2 Ω at

(a) 800^{0}C (b) 700^{0}C (c) 820^{0}C (d) 850^{0}C

14. The internal resistance of a 2.1 V cell which gives a current of 0.2 A through a resistance of 10 Ω

(a) 0.2 Ω (b) 0.8 Ω (c) 1 Ω (d) 0.5 Ω

15. In Joule's heating law, when R and t are constant, if the H is taken along the y axis and I^2 along the x axis , the graph is

(a) straight line (b) parabola (c) circle (d) ellipse

PART – II

Answer **any six** of the following questions. Q. No. **24 is compulsory** 6x2=12

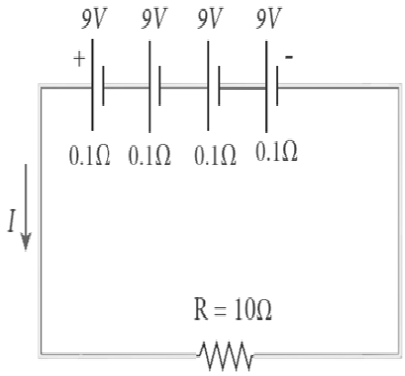
16. Define Current density and write their unit.
17. State Kirchhoff's Junction Rule
18. Define Seebeck Effect
19. State Joule's law of heating.
20. What are the properties of the substance used as heating element?
21. Distinguish between electric energy and electric power.
22. Find the heat energy produced in a resistance of 10 Ω when 5A current flows through it for 5 minutes.
23. State the principle of Potentiometer.
24. A copper wire of cross-sectional area 0.5 mm2 carries a current of 0.2 A. If the free electron density of copper is 8.4×10^{28} m^{-3} then compute the drift velocity of free electrons.

PART – III

Answer **any six** of the following questions. Q. No. **33 is compulsory** 6x3=18

25. The resistance of a nichrome wire at 0^0C is 10 Ω. If its temperature coefficient of resistance is 0.004/^{0}C, find its resistance at boiling point of water. Comment on the result.
26. Derive the relation between the drift velocity and the current.
27. Write note electric cells in series.
28. Explain Thomson Effect.
29. Define temperature coefficient of resistivity. Obtain an expression for it.
30. Two cells each of 5V are connected in series across a 8 Ω resistor and three parallel resistors of 4 Ω, 6 Ω and 12 Ω. Draw a circuit diagram for the above arrangement. Calculate i) the current drawn from the cell ii) current through each resistor.
31. Write a note on carbon resistors.
32. Describe the microscopic model of current and obtain general form of Ohm's law

33. From the given circuit, Find



i) Equivalent emf of the combination

ii) Equivalent internal resistance

iii) Total current

iv) Potential difference across external resistance

v) Potential difference across each cell

PART – IV

Answer **all** the questions. 5x5=25

34. Obtain the macroscopic form of ohm's law from its microscopic form and discuss its limitation.

(OR)

Explain the equivalent resistance of a series and parallel resistance network.

35. Explain the determination of the internal resistance of a cell using voltmeter.

(OR)

Obtain the condition for bridge balance in Whetstone's bridge.

36. Explain the determination of unknown resistance using Meter Bridge.

(OR)

How the emf of two cells are compared using Potentiometer?

37. State and explain Kirchhoff's rules.

(OR)

i) Distinguish between drift velocity and mobility.

ii) Define electrical resistivity.

38. Explain the measurement of internal resistance of a cell by potentiometer.

(OR)

Write note electric cells in parallel.

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PART – III

இயற்பியல் / PHYSICS

Time Allowed: 3:00 Hours] [Maximum Marks: 70

Instructions :

(1) Check the question paper for fairness of printing. If there is any lack of fairness, inform the Hall Supervisor immediately.

(2) Use Blue or Black ink to write and underline and pencil to draw diagrams.

PART – I

Note : (i) Answer **all** the questions. 15x1=15

(ii) Choose the most appropriate answer from the given four alternatives and write the option code and the corresponding answer.

1. The force experienced by a particle having mass m and charge q accelerated through a potential difference V when it is kept under perpendicular magnetic field $\vec{B}$ is

(a) $\sqrt{\frac{2q^3BV}{m}}$ (b) $\sqrt{\frac{q^3B^2V}{2m}}$ (c) $\sqrt{\frac{2q^3B^2V}{m}}$ (d) $\sqrt{\frac{2q^3BV}{m^3}}$

2. A circular coil of radius 5 cm and 50 turns carries a current of 3 ampere. The magnetic dipole moment of the coil is

(a) 1.0 amp – m^2 (b) 1.2 amp – m^2 (c) 0.5 amp – m^2 (d) 0.8 amp – m^2

3. A wire of length *l* carries a current I along the Y direction and magnetic field is given by $\vec{B} = \frac{\beta}{\sqrt{3}}(\vec{i} + \vec{j} + \vec{k})T$. The magnitude of Lorentz force acting on the wire is

a) $\sqrt{\frac{2}{\sqrt{3}}}\beta Il$ b) $\sqrt{\frac{1}{\sqrt{3}}}\beta Il$ c) $\sqrt{2}\,\beta Il$ d) $\sqrt{\frac{1}{\sqrt{2}}}\beta Il$

4. A simple pendulum with charged bob is oscillating with time period T and let θ be the angular displacement. If the uniform magnetic field is switched ON in a direction perpendicular to the plane of oscillation then

(a) Time period will decrease but θ will remain constant

(b) Time period remain constant but θ will decrease

(c) Both T and θ will remain the same

(d) Both T and θ will decrease

5. The vertical component of Earth's magnetic field at a place is equal to the horizontal component. What is the value of angle of dip at this place?
(a) 30^o (b) 45^o (c) 60^o (d) 90^o

6. A non-conducting charged ring of charge q, mass m and radius r is rotated with constant angular speed ω. Find the ratio of its magnetic moment with angular momentum is
(a) $\frac{q}{m}$ (b) $\frac{2q}{m}$ (c) $\frac{q}{2m}$ (d) $\frac{q}{4m}$

7. Three wires of equal lengths are bent in the form of loops. One of the loops is circle, another is a semi-circle and the third one is a square. They are placed in a uniform magnetic field and same electric current is passed through them. Which of the following loop configuration will experience greater torque?
(a) circle (b) semi-circle c) square (d) all of them

8. The SI unit of pole strength is
(a) Am (b) Am^2 (c) Am^{-2} (d) Am^{-1}

9. The relative permeability of a paramagnetic material is
(a) greater than unity (b) less than unity (c) equal to unity (d) negative

10. When a charged particle enters a uniform magnetic field its kinetic energy
(a) remains constant (b) increase (c) decrease (d) becomes zero

11. At curie point, a ferromagnetic material becomes
(a) Non magnetic (b) diamagnetic
(c) paramagnetic (d) anti ferromagnetic

12. Relative permeability of iron is 5500. Its magnetic susceptibility is
(a) 5501 (b) 5500×10^{-7} (c) 5499 (d) 5500×10^7

13. A moving charge produces
(a) An electric field only (b) a magnetic field only
(c) neither an electric nor a magnetic field
(d) both electric and magnetic fields

14. In a moving coil galvanometer the current '*i*' is related to the deflection θ is
(a) $i \propto \theta$ (b) $i \propto \tan\theta$ (c) $i \propto \theta^2$ (d) $i \propto \sqrt{\theta}$

15. A circular loop of area $0.01m^2$ and carrying a current of 10A is placed parallel to a magnetic field of intensity 0.1T. the torque acting on the loop, in Nm is
(a) 0.8 (b) 0.001 (c) 0.01 (d) 1.1

PART – II

Answer **any six** of the following questions. Q. No. **24 is compulsory** 6x2=12

16. Two materials X and Y are magnetized, whose intensity of magnetization are 500 Am^{-1} and 2000 Am^{-1}, respectively. If the magnetizing field is 1000 Am^{-1}, then which one among these materials can be easily magnetized?
17. Define magnetic dipole moment.
18. State Ampere's circuital law.
19. State Fleming's Left Hand Rule (FLHR).
20. How the current sensitivity of galvanometer can be increased?
21. Define one ampere.
22. What are the limitations of cyclotron?
23. What is Hysteresis?
24. Compute the intensity of magnetisation of the bar magnet whose mass, magnetic moment and density are 200 g, 2 A m2 and 8 g cm^{-3}, respectively.

PART – III

Answer **any six** of the following questions. Q. No. **33 is compulsory** 6x3=18

25. A coil of a tangent galvanometer of diametre 0.24 m has 100 turns. If the horizontal component of Earth's magnetic field is 25×10^{-6} T then, calculate the current which gives a deflection of 60^0.
26. What are the properties of bar magnet?
27. State and explain Biot - Savart law.
28. Give the properties of Lorentz magnetic force.
29. Suppose a cyclotron is operated to accelerate protons with a magnetic field of strength 1 T. Calculate the frequency in which the electric field between two Dees could be reversed.
30. How Galvanometer can be converted in to Ammeter.
31. What are called dia, para and ferro magnetic material?.
32. Calculate the torque acting on a bar magnet in uniform magnetic field.
33. The resistance of a moving coil galvanometer is made twice its original value in order to increase current sensitivity by 50%. Find the percentage change in voltage sensitivity.

PART – IV

Answer **all** the questions. 5x5=25

34. Calculate the magnetic induction at a point on the axial line of a bar magnet.

(OR)

Define Hysteresis. Explain it with help of diagram.

35. Obtain the magnetic induction at a point on the equatorial line of a bar magnet.

(OR)

Deduce the relation for magnetic induction at a point due to an infinitely long straight conductor carrying current.

36. Obtain an expression for magnetic field due to long current carrying solenoid.

(OR)

Describe the principle, construction and working of Cyclotron.

37. Obtain an expression for the force on a current carrying conductor placed in a magnetic field.

(OR)

Obtain a force between two long parallel current carrying conductors.

38. Describe the principle, construction and working of moving coil galvanometer.

(OR)

Obtain the expression for force on a moving charge in a magnetic field.

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PART – III

இயற்பியல் / PHYSICS

Time Allowed: 3:00 Hours] [Maximum Marks: 70

Instructions :

(1) Check the question paper for fairness of printing. If there is any lack of fairness, inform the Hall Supervisor immediately.

(2) Use Blue or Black ink to write and underline and pencil to draw diagrams.

PART – I

Note : (i) Answer **all** the questions. 15x1=15

(ii) Choose the most appropriate answer from the given four alternatives and write the option code and the corresponding answer.

01. The flux linked with a coil at any instant t is given by $\emptyset_B = 10t^2 - 50t+250$. The induced emf at t = 3s is

(a) −190 *V* (b) −10 *V* (c) 10 *V* (d) 190 *V*

02. When the current changes from +2A to −2A in 0.05 s, an emf of 8 V is induced in a coil. The co-efficient of self-induction of the coil is

(a) 0.2 H (b) 0.4 H (c) 0.8 H (d) 0.1 H

03. In a transformer, the number of turns in the primary and the secondary are 410 and 1230 respectively. If the current in primary is 6A, then that in the secondary coil is

(a) 2 A (b) 18 A (c) 12 A (d) 1 A

04. A step-down transformer reduces the supply voltage from 220 V to 11 V and increase the current from 6 A to 100 A. Then its efficiency is

(a) 1.2 (b) 0.83 (c) 0.12 (d) 0.9

05. In a series resonant RLC circuit, the voltage across 100 Ω resistors is 40 V. The resonant frequency ω is 250 rad/s. If the value of C is 4μF,then the voltage across L is

(a) 600 V (b) 4000 V (c) 400V (d) 1 V

06. An inductor 20 mH, a capacitor 50 μF and a resistor 40 Ω are connected in series across a source of emf v = 10 sin 340 t. The power loss in AC circuit is

(a) 0.76 W (b) 0.89 W (c) 0.46 W (d) 0.67 W

07. The instantaneous values of alternating current and voltage in a circuit are $i = \frac{1}{\sqrt{2}} \sin(100\pi t)$ A and $v = \frac{1}{\sqrt{2}} \sin(100\pi t + \frac{\pi}{3})$ V. The average power in watts consumed in the circuit is

(a) $\frac{1}{4}$ (b) $\frac{\sqrt{3}}{4}$ (c) $\frac{1}{2}$ (d) $\frac{1}{8}$

08. In an oscillating LC circuit, the maximum charge on the capacitor is Q. The charge on the capacitor when the energy is stored equally between the electric and magnetic fields is

(a) $\frac{Q}{2}$ (b) $\frac{Q}{\sqrt{3}}$ (c) $\frac{Q}{\sqrt{2}}$ (d) Q

09. The inductance of a coil is proportional to

(a) its length (b) the number of turns

(c) square of the number of turns (d) the resistance of the coil

10. Faraday's law of electromagnetic induction is related to the

(a) Third law of motion (b) Law of conservation of energy

(c) Law of conservation of charge

(d) Law of conservation of angular momentum

11. An emf of 5V is induced in an inductance when the current in it changes at a steady rate from 3A to 2A in 1 millisecond. The value of inductance is

(a) 5mH (b) 5H (c) 5000H (d) zero

12. A coil of cross sectional area 400 cm^2 having 30 turns is making 1800 rev / min in a magnetic field of 1T, the peak value of the induced emf is

(a) 113 V (b) 226 V (c) 339 V (d) 452 V

13. The core of a transformer is laminated to reduce

(a) Copper loss (b) Magnetic loss (c) Eddy current loss (d) Hysteresis loss

14. In s series RLC circuit R = 10 Ω and the impedance Z = 20 Ω. Then the phase difference between the current and the voltage is

(a) 60^0 (b) 30^0 (c) 45^0 (d) 90^0

15. Quantity that remains unchanged in a transformer is

(a) Voltage (b) current (c) frequency (d) none of these

PART – II

Answer **any six** of the following questions. Q. No. **24 is compulsory** 6x2=12

16. State Fleming's Right Hand Rule.
17. What the methods of producing induced emf?
18. Define RMS value of AC.
19. A straight conducting wire is dropped horizontally from a certain height with its length along east – west direction. Will an emf be induced in it? Justify your answer.
20. What are the applications of series RLC resonant circuit?
21. The self-inductance of an air-core solenoid is 4.8 mH. If its core is replaced by iron core, then its self-inductance becomes 1.8 H. Find out the relative permeability of iron.
22. Define Q - factor or quality factor.
23. State Faraday's laws of electromagnetic induction.
24. A coil of 200 turns carries a current of 0.4 A. If the magnetic flux of 4 mWb is linked with the coil, find the inductance of the coil.

PART – III

Answer **any six** of the following questions. Q. No. **33 is compulsory** 6x3=18

25. What are the advantages and disadvantages of AC over DC?
26. An inductor of inductance 'L' carries an electric current 'i'. How much energy is stored while establishing the current in it?
27. How will you induce an emf by changing the area enclosed by the coil?
28. Find the impedance of a series RLC circuit if the inductive reactance, capacitive reactance and resistance are 184 Ω, 144 Ω and 30 Ω respectively. Also calculate the phase angle between voltage and current.
29. Explain various energy losses in a transformer.
30. Find out the phase relationship between voltage and current in a pure resistive circuit.
31. The equation for an alternating current is given by i = 77 sin 314t. Find the peak value, frequency, time period and instantaneous value at t = 2 ms.
32. Explain resonance in series RLC circuit.

33. An ideal transformer has 460 and 40,000 turns in the primary and secondary coils respectively. Find the voltage developed per turn of the secondary if the transformer is connected to a 230 V AC mains. The secondary is given to a load of resistance $10^4\,\Omega$. Calculate the power delivered to the load.

PART – IV

Answer **all** the questions. 5x5=25

34. Explain the applications of eddy currents (or) Foucault currents.

(OR)

Elaborate the standard construction details of AC generator.

35. Show mathematically that the rotation of a coil in a magnetic field over one rotation induces an alternating emf of one cycle.

(OR)

Explain the principle, construction and working of transformer.

36. Derive an expression for phase angle between the applied voltage and current in a series RLC circuit.

(OR)

Compare the electromagnetic oscillations of LC circuit with the mechanical

37. What are called LC oscillations? Explain the generation of LC oscillations.

(OR)

Find out the phase relationship between voltage and current in a pure resistive circuit.

38. Find out the phase relationship between voltage and current in a pure capacitive circuit.

(OR)

Explain the working of a single - phase AC generator with necessary diagram.

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PART – III

இயற்பியல் / PHYSICS

Time Allowed: 3:00 Hours] [Maximum Marks: 70

Instructions :

(1) Check the question paper for fairness of printing. If there is any lack of fairness, inform the Hall Supervisor immediately.

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PART – I

Note : (i) Answer **all** the questions. 15x1=15

(ii) Choose the most appropriate answer from the given four alternatives and write the option code and the corresponding answer.

01. The dimension of $\frac{1}{\mu_0 \varepsilon_0}$ is

(a) $[L\ T^{-1}]$ (b) $[L^2\ T^{-2}]$ (c) $[L^{-1}\ T]$ (d) $[L^{-2}\ T^2]$

02. If the amplitude of the magnetic fi eld is 3×10^{-6} T, then amplitude of the electric field for a electromagnetic waves is

(a) 100 V m^{-1} (b) 300 V m^{-1} (c) 600 V m^{-1} (d) 900 V m^{-1}

03. Which of the following electromagnetic radiation is used for viewing objects through fog (a) microwave (b) gamma rays (c) X- rays (d) infrared

04. Which of the following are false for electromagnetic waves

(a) transverse (b) mechanical waves

(c) longitudinal (d) produced by accelerating charges

05. Let $E = E_0 \sin[10^6 x - \omega t]$ be the electric field of plane electromagnetic wave, the value of ω is

(a) 0.3×10^{-14} rad s^{-1} (b) 3×10^{-14} rad s^{-1} (c) 0.3×10^{14} rad s^{-1} (d) 3×10^{14} rad s^{-1}

06. Which of the following is NOT true for electromagnetic waves?.

(a) it transport energy (b) it transport momentum

(c) it transport angular momentum

(d) in vacuum, it travels with different speeds which depend on their frequency

07. The electric and magnetic fields of an electromagnetic wave are

(a) in phase and perpendicular to each other

(b) out of phase and not perpendicular to each other

(c) in phase and not perpendicular to each other

(d) out of phase and perpendicular to each other

08. If the magnetic monopole exists, then which of the Maxwell's equation to be modified?.

(a) $\oint \vec{E}.d\vec{A} = \frac{Q_{enclosed}}{\varepsilon_0}$ (b) $\oint \vec{E}.d\vec{A} = 0$

(c) $\oint \vec{E}.d\vec{A} = \mu_0 I_{enclosed} + \mu_0\varepsilon_0 \frac{d}{dt}\int \vec{E}.d\vec{A}$ (d) $\vec{E}.d\vec{l} = -k\frac{d}{dt}\phi_B$

09. Frequency of a wave is $6x10^{15}$Hz. The wave is

(a) Radio wave (b) Microwave (c) X – ray (d) UV rays

10. Which of the following has maximum frequency?

(a) X – Rays (b) IR Rays (c) UV Rays (d) Radio waves

11. Electromagnetic radiation of frequency $3x10^5$ MHz lies in the

(a) Radio wave region (b) Visible region (c) IR region (d) Microwave region

12. Consider an electric charge oscillating with frequency of 10MHz. the radiation emitted will have a wavelength equal to

(a) 20m (b) 30m (c) 40m (d) 10m

13. The frequencies of X – rays , γ - rays and UV rays are respectively a, b and c. Then

(a) a < b, b < c (b) a < b, b > c (c) a > b, b > c (d) a > b, b < c

14. In an electromagnetic wave the electric field vector $\vec{E}$ and magnetic field vector $\vec{B}$ are

(a) Perpendicular to each other (b) parallel to each other

(c) at 45^0 to each other (d) can have any angle between them

15. TV waves have a wavelength range of 1 – 10 metre. Their frequency range in MHz is

(a) 300 – 3000 (b) 3 – 3000 (c) 30 – 300 (d) 3 – 30

PART – II

Answer **any six** of the following questions. Q. No. **24 is compulsory** 6x2=12

16. Give the modified form of Ampere's circuital law.
17. Define Fraunhofer lines.
18. What are the uses of Fraunhofer lines?
19. Define intensity of electromagnetic wave.
20. The relative magnetic permeability of the medium is 2.5 and the relative electrical permittivity of the medium is 2.25. Compute the refractive index of the medium.
21. What is called pointing vector? Give its unit.
22. Compute the speed of the electromagnetic wave in a medium if the amplitude of electric and magnetic fields are 3×10^{4} N C^{-1} and 2×10^{-4} T, respectively.
23. Difference between absorption spectra and emission spectra
24. A pulse of light of duration 10^{-6} s is absorbed completely by a small object initially at rest. If the power of the pulse is 60×10^{-3} W, calculate the final momentum of the object.

PART – III

Answer **any six** of the following questions. Q. No. **33 is compulsory** 6x3=18

25. Discuss briefly the experiment conducted by Hertz to produce and detect electromagnetic spectrum.
26. If the relative permeability and relative permittivity of the medium is 1.0 and 2.25, respectively. Find the speed of the electromagnetic wave in this medium.
27. Obtain an expression for energy density associated with an electromagnetic wave propagating in vacuum or free space.
28. Explain the sources of electromagnetic waves.
29. Write a note on gamma rays
30. Define displacement current.
31. Write a note on Radio waves.
32. Write a note on infra microwaves.

33. A transmitter consists of LC circuit with an inductance of 1 μH and a capacitance of 1 μF. What is the wavelength of the electromagnetic waves it emits?

PART – IV

Answer **all** the questions. 5x5=25

34. Write down Maxwell equations in integral form.

(OR)

Explain the modification of Ampere's circuital law.

35. Explain the properties of electromagnetic waves.

(OR)

Explain in detail the emission spectra.

36. Explain in detail the absorption spectra.

(OR)

Write about sources of electromagnetic waves

37. Write a note on microwaves

(OR)

A magnetron in a microwave oven emits electromagnetic waves (em waves) with frequency f = 2450 MHz. What magnetic field strength is required for electrons to move in circular paths with this frequency?

38. i) Write a note visible light.

ii) Write a note on X - rays.

(OR)

Consider a parallel plate capacitor which is maintained at potential of 200 V. If the separation distance between the plates of the capacitor and area of the plates are 1 mm and 20 cm^2. Calculate the displacement current for the time in μs.

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