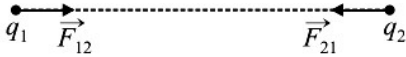


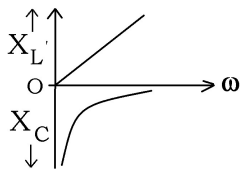
(The figures in the margin indicate full marks for the questions)

Each of the following questions carries 1 mark each -

1. According to Coulomb's law, which is the correct relation for the following figure? **1**



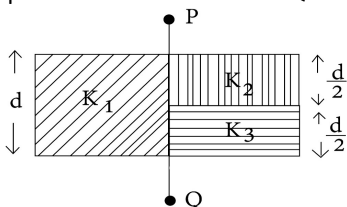
- (i) $q_1 q_2 > 0$ (ii) $q_1 q_2 = 0$ (c) $q_1 q_2 < 0$ (b) $q_1 q_2 = 1$
2. Inside a conductor, electric field is _____ (zero / constant), where as electric potential is _____ (zero / constant).
 [Fill up both the blank positions]
3. The resistivity of alloy manganin
 (i) Increases rapidly with increases of temperature
 (ii) Decreases linearly with increases in temperature
 (iii) Increases rapidly with decreases in temperature
 (iv) Is nearly independent of temperature
4. If two identical currents, flowing through straight conductors of infinite extent, separated by 1 m in vacuum, made to attract each other by a force of $2 \times 10^{-7} \text{ N/m}$, then magnitude of the current is _____. (Fill up the blank)
5. From Gauss's law of magnetism, it is known that, magnet never exit as a _____ (Fill up the blank)
6. Define 1 henry .
7. The looping current induced in the surface of a conductor, when placed in a varying magnetic field is known as _____. (Fill up the blank)
8. Locate the resonant angular frequency ω_0 in the following graph between X_L and X_C with ω .



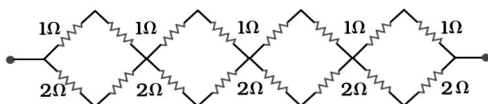
Each of the following questions carries 2 mark each -

9. Match the following -----
- (A) Electric potential ----- (a) $[\text{M}^1 \text{L}^0 \text{T}^{-2} \text{A}^{-1}]$
 (B) Electric permittivity ----- (b) $[\text{M}^{-1} \text{L}^{-2} \text{T}^4 \text{A}^2]$
 (C) Capacitance ----- (c) $[\text{M}^{-1} \text{L}^{-3} \text{T}^4 \text{A}^2]$
 (D) Magnetic field ----- (d) $[\text{M}^1 \text{L}^2 \text{T}^{-3} \text{A}^{-1}]$
10. A parallel plate capacitor with air between the plates has a capacitance of 12 pF ($1 \text{ pF} = 10^{-12} \text{ F}$). What will be the capacitance if the distance between the plates is reduced by half, and the space between them is filled with a substance of dielectric constant 5 ?

Or
 Find equivalent capacitance between P and Q



11. Determine the equivalent resistance of networks shown below



12. How would you connect resistances 1Ω , 3Ω and 6Ω so as to get equivalent resistances of 0.67Ω and 3Ω . Draw the required circuit diagram .

13. A proton, a deuterium and an α -particle, with same kinetic energy, enter perpendicularly into a region of uniform magnetic field. Compare the radii of circular paths followed by them.
14. Explain how Lenz's law establishes the law of conservation of energy.

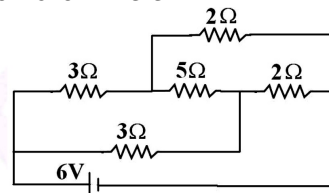
Or
 Show that total energy required to build up a current I in an inductor of coefficient of induction 'L' is $\frac{1}{2} LI^2$.

15. Find the expression for the emf induced in a rod rotating perpendicularly in a uniform magnetic field acting perpendicularly inward to the plane of paper .
- Or
 A long solenoid with 15 turns per cm has a small loop of area 2.0 cm^2 placed inside the solenoid normal to its axis. If the current carried by the solenoid changes steadily from 2.0 A to 4.0 A in 0.1 s, what is the induced emf in the loop while the current is changing?
16. Draw the wavefront due to
 (i) a source at infinity
 (ii) the dispersion light through a prism .
17. The intensity of two superposing waves are $4I_0$ and I_0 . The intensity of the bright fringe is $7I_0$. Find out the phase difference between the two superposing waves.
18. Draw the energy bands diagram of N-type semiconductor and P-type semiconductor at $T > 0 \text{ K}$.

Or
 Draw the energy bands diagram of an intrinsic semiconductor at $T = 0 \text{ K}$ behaves like insulator and at $T > 0 \text{ K}$ behaving like a conductor .

Each of the following questions carries 3 marks each -

19. State Gauss's law.
 Find an expression for electric field due to a straight conductor of infinite extent having λ as linear charge density .
- Or
 What is electric dipole moment ? Give its SI unit .
 Two point charges $+q$ and $-q$ are placed at $(-a, 0)$ and $(+a, 0)$ on the X-axis . Calculate electric field due to this arrangement of charges at $(0, +a)$ on the Y axis . **1+2 =3**
20. State Kirchoff's loop law and name the laws on which they are based on.
 Calculate the current drawn from the battery in the given network shown here.



1+2 =3

- Or
 Find the expression for resistivity of the material of a conductor. **3**
21. Using Biot Savart's law, find an expression magnetic field due a current loop at a point on its axis. **3**
- Or
 Using Ampere's circuital law, find the magnetic field due a solenoid . **3**
22. Establish Ampere's Maxwell equation . **3**
- Or
 Give two important properties of γ rays, X rays and Ultra violet rays . **2 x 1/2 x 3 =3**
23. Draw the ray diagram showing the formation of image of a tiny object by a compound telescope .
 WA small telescope has an objective lens of focal length 120cm and an eyepiece of focal length 4cm . What is the magnifying

