FIRST TERM EXAMINATION (14 SEPT 2017)

Paper - PHYSICS

Class – XII

(SET – B)

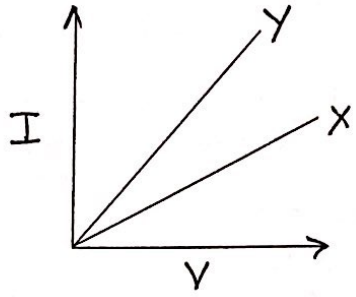
Time: 3hrs. **MM: 70**

Q1. Why does solenoid contract when a current is passed through it? (1)

Q2. On increasing the current drawn from a cell the potential difference across terminals is lowered. Why? (1)

Q3. Why do electric field lines never cross each other? (1)

Q4. The voltage current variation of two metallic wires X and Y at constant temperature are shown in figure assuming that wires have same length and same diameter explain which of the two wires will have larger resistivity. (1)

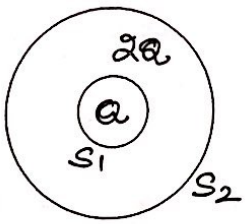


Q5. How does the mutual inductance of a pair of coils changes when the distance between the coils is increased. (1)

Q6. S_1 and S_2 are two parallel concentric sphere enclosing charges Q and 2Q respectively as shown in fig.

a) What is the ratio of the electric flux through S_1 and S_2

b) How will the electric flux through a sphere S_1 change if a medium of dielectric constant 3 is introduced in the space inside S_1 in place of air. (2)



Q7. A potential difference V is applied across a conductor of length L and diameter D. How are the electric field E and resistor R of conductor affected when in turn (2)

a) V is halved

b) L is halved

Q8. Draw a hysteresis curve and hence define retentivity and coercivity of magnetic element. (2)

Q9. Derive an expression for average power in an a.c. circuit (2)

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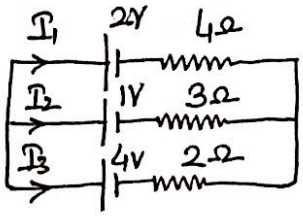
Q10. Find I_1, I_2, I_3 in the following circuit. (2)



Q11.a) Why are the connection between the resistor in a meter bridge made of thick copper strips. (3)

b) Why is it generally preferred to obtain the balance point in the middle of the meter bridge wire?

a) Which material is used for the meter bridge wire and why?

Q12. Define drift velocity and deduce ohm's law using the concept of drift velocity. (3)

Q13. Derive the expression for the energy stored in a charged capacitor and prove that energy stored per unit volume in a capacitor is given by $\frac{1}{2}\epsilon_0 E^2$. (3)

Q14. A parallel plate capacitor of plate area A and separation 'd' is charged to a potential difference V. The battery used to charge it remain connected. A dielectric slab of thickness d and dielectric constant K is now placed between the plates what change if any will take place in (3)

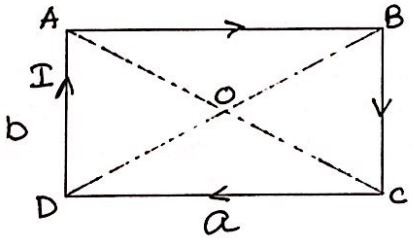
a) Capacitance of the capacitor
b) Charge on the plates
c) Electric field intensity between the plates

Q15. Three point charges +q +2q and Q are placed at three vertices of an equilateral triangle. Find the value of charge Q (in terms of q) so that electric potential energy of the system is zero. (3)

Q16. Derive the expression for the force per unit length between two long parallel straight current carrying conductor what is the nature of force if two wires carries current in opposite direction. (3)

Q17. Two resistance coils of 100Ω *and* 200Ω resp. are connected in series across 100V. A moving coil voltmeter of 200Ω is connected in turn across each coil. What will it reads in each case. (3)

Q18. A rectangular loop of metallic wire is of length 'a' and breadth b and carries a current I. Find the magnitude of magnetic field at the centre O of the loop. (3)



Q19. A conducting rod of length l with one end pivoted is rotated with uniform angular speed 'w' in a vertical plane, normal to a uniform magnetic field B. Deduce expression for the emf induced in this rod. (3)

Q20. A $25\mu F$ capacitor, 0.1H inductor and a 25Ω resistor are connected in series with a source whose emf is given by (3)

E= 310cos 314t volt

a) What is the frequency of the emf?
b) What is the reactance of the circuit?

Q21. What are LC oscillations? Explain qualitatively how these oscillations are produced. Show that in free oscillations of an LC circuit the sum of energies stored in capacitor and inductor is constant in time. (3)

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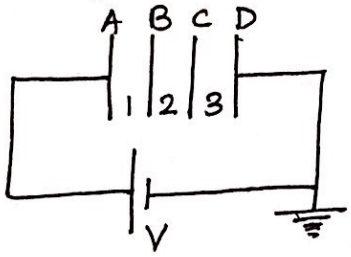
Q22. A, B, C, D are four thin similar metal plates, equally separated by distanced and connected to a cell of p.d.v.

i) Write potentials of A, B, C, D
ii) If B and C be connected by a wire then what will be potentials of plates? (3)



Q23. Mohit spent few years in USA and then returned back to India. Once he discussed with his friend Sumit on domestic supply in USA and In India. In USA, domestic power supply is at 110V, 50Hz, while in India it is 220 V, 50 Hz. Mohit insisted that USA supply is better than Indian supply. Both went to Sumit's father who was an electrical engineer and sought his opinion on the issue. He explained that both types of supplies have advantages and disadvantages. (4)

a) What are the values shown by Mohit and Sumit?
b) Give one advantage and one disadvantage of 220 V supply over 110 V supply.

Q24. Draw a schematic diagram of step up transformer. Explain its principle, construction and working. Deduce the expression for secondary to primary voltage in terms of number of turns in the two coils and current through two coils. What are the various losses involved in it. (5)

OR

AC voltage $E=E_0 \sin \omega t$ is applied across a series combination of an inductor L, capacitor C and a resistor R. Use the phasor diagram solution to obtain expression for the

a) Impedance of circuit
b) Phase angle between applied voltage and resulting current in the circuit
c) Obtain the conditions for resonance to occur
d) Define power factor
e) State condition under which it is (i) maximum (ii) minimum (5)

Q25.a) Using Blot savart law derive the expression for magnetic field in the vector form at a point on the axis of circular current loop.

b) What does a toroid consist of? Find out the expression for the magnetic field inside toroid for N turns of the coil having average radius 'r' and carrying current I. Show that the magnetic field in the open space inside and exterior to the toroid is zero. (5)

OR

a) Draw a schematic sketch of cyclotron. Explain clearly the role of crossed electric and magnetic field in accelerating the charge. Hence derive the expression for KE acquired by the particles.
b) A alpha (α) particle and a proton are released from the centre of cyclotron and made to accelerate

Answer the following:

i) Can both be accelerated at the same cyclotron frequency? Give reasons
ii) When they are accelerated in turn which of two will have higher velocity at the exit slit of the dees. (5)

Q26.a) Define electric dipole moment. Is it scalar or vector? Derive the expression for the electric field of a dipole at a point on the equatorial plane of the dipole.

b) Draw equipotential surfaces due to an electric dipole. Locate the points where the potential due to dipole is zero. (5)

OR

a) Using Gauss's law deduce the expression for the electric field due to a uniformly charged spherical shell of radius R at a point: i) outside ii) inside the shell
b) Plot the Graph showing variation of Electric field as a function of $r > R$ and $r < R$/ (r being distance from the centre of shell). (5)

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