2017-2018

D.A.V. PUBLIC SCHOOL, KAILASH HILLS

HALF YEARLY EXAM

CLASS-XII

Time: 3hrs **PHYSICS** **Max.Marks:70**

General Instructions:

Q. No. 1 -5 are of 1 mark each.

Q. No. 6-10 are of 2 marks each.

Q. No. 11-22 are of 3 marks each.

Q. No. 23 is a value based question of 4 marks.

Q. No. 24-26 are of 5 marks each.

Q1. What is the net charge on a charged capacitor? $q = CV$ (1)

Q2. Two identical cells, each of emf E, having negligible internal resistance r, are connected in parallel with each other across an external resistance R. What is the current through this resistance? (1)

$\mathcal{E} = V - Ir$
$\mathcal{E} + Ir = V$
$Ir = V - \mathcal{E}$
$I = \frac{V - \mathcal{E}}{r}$
$I = V - \mathcal{E}$

Q3. What does the area of hysteresis loop indicate? area of hysteresis loop indicates that the (1)

Q4. What is the force experienced by a charge 'q' moving with a velocity 'v' in a magnetic field '$\vec{B}$'? $F = qvB\sin\theta$ (1)

Q5. What is wattless current? in which one component does not use any power (1)

$\mathcal{E} = \frac{M}{-Ir}$

$I = \frac{M}{-r\mathcal{E}}$

Q6. Three capacitors each of capacitance 9 pF are connected in series (a) What is the total capacitance of the combination?

(b) What is the potential difference across each capacitor when the combination is connected to a 120 V supply? (2)

Q7. If the horizontal component of earth's magnetic field at a place where the angle of dip is 60° is 0.4×10^{-4} tesla, calculate the vertical component and the resultant magnetic field at that place. (2)

Q8. Electromagnetic waves with wavelength

(i) λ_1 are used to treat muscular strain

(ii) λ_2 are used by a FM radio station for broadcasting

(iii) λ_3 are used to detect fracture in bones.

(iv) λ_4 are absorbed by the ozone layer of the atmosphere

Identity and name the part of electromagnetic spectrum to which these radiations belong. (2)

Q9. A wheel with 10 metallic spokes each 0.5m long is rotated with a speed by 120 rev/min. in a plane normal to the horizontal component by earth's magnetic field B_H at a place. If $B_H = 0.4$ G at the place, what is the induced emf between the axle and the rim of the wheel? $1G = 10^{-4}$ T. (2)

Q10. Prove that the current density of a metallic conductor is directly proportional to the drift speed of electrons.

Or

What is internal resistance of a cell? Derive an expression for it.

Q11. Sketch equipotential surfaces for

(i) a positive point charge.

(ii) a uniform electric field.

(iii) two equal and opposite charges separated by a small distance.

Q12. An electric dipole is held in a uniform electric field.

(i) Show that it does not undergo any translatory motion.

(ii) Derive an expression for the torque acting on it . (3)

Q13. Calculate the temperature at which the resistance of a conductor becomes 20% more than its resistance at 27°C. The value of the temperature coefficient of resistance of the conductor is 2.0×10^{-4}/K. (3)

Q14. Compare any three properties of diamagnetic, paramagnetic and ferromagnetic substance. (3)

Q15. With the help of a diagram, explain the principle of working of a transformer. (3)

Q16. Prove that an ideal capacitor does not dissipate power is an a.c. circuit. Draw a graph showing the variation of capacitive reactance with frequency of a.c. source. (3)

Q17. A series LCR circuit with L = 0.12H, C = 480nF. R=23Ω is connected to a 230V variable frequency supply.

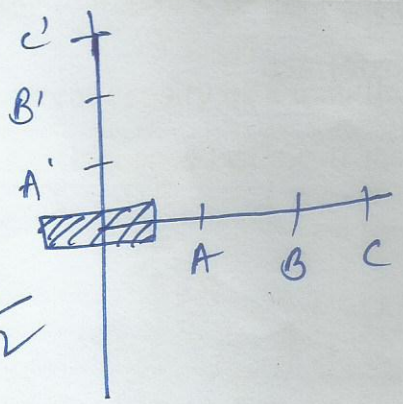
(i) What is the source frequency for which current amplitude is maximum? Obtain this maximum value.

(ii) For which frequencies of the source is the power transferred to the circuit half the power at resonant frequency? (3)

Q18. State and explain Faraday's laws of electromagnetic induction. (3)

Q19. The following data was obtained for the dependence of the magnitude of electric field, with distance, from a reference point O, within the charge distribution in the shaded region

Field point	A	B	C	A'	B'	C'
Magnitude of electric field	E	E/8	E/27	E/2	E/16	E/64



(i) Identify the charge distribution and justify your answer.

(ii) If the potential due to this charge distribution, has a value V at the point A, what is its value at the point 'A'? (3)

Q20. Define e.m. wave. Draw a sketch showing the propagation of the e.m. wave, indicating the direction of the oscillating electric and magnetic fields. (3)

Q21. State Gauss's theorem in electrostatics and using this theorem show that for any point outside the shell the field due to uniformly charged thin spherical shell is the same as if entire charge of the shell is concentrated at the centre. (3)

Q22. State Biot-Savart law for the magnetic field due to a current carrying element. Use this law to obtain magnetic field at the centre of a circular loop of radius R carrying a steady current I.

Or

Explain why the field due to the long solenoid at its interior mid-point is uniform and strong whereas at the exterior point field is weak and is along the axis of the solenoid with no perpendicular component? (3)

Q23. Shama, a science student, while studying was impressed that the nervous system in animals depends on the electrical signals to work. Neurons pass on signals from sense organs to the

brain. The passage of an electrical signal constitutes an electric current. Shama was curious to know the range of current in different situations. She found that current is domestic appliances is a few amperes. During lightning, the electric current is in tens of thousands of amperes,while in the nervous system ,it is only a few microamperes .She further discussed with her teacher about the magnitude of the magnetic field created by these currents.

(i) What values did Shama have?

(ii) A galvanometer coil has a resistance of 15 ohms and the meter shows full scale deflection for a current by 4 mA. How will you convert the meter into an ammeter of range 0-6 A? (4)

Q24. With the help of a neat and labeled diagram, explain the principle and working of a moving coil galvanometer. What is the function of

(i) Uniform radial field.

(ii) Soft iron core

in such a device?

or

With the help of a neat and labeled diagram, explain how a positively charged particle gets accelerated in a cyclotron. Show mathematically that the cyclotron frequency does not

depend upon the speed of the particle?

(5)

25. Using the principle of wheatstone bridge, describe the method to determine the specific resistance of a wire the laboratory. Draw the circuit diagram and write the formula used. Write any two precautious you would observe while performing the experiment.

Or

Define the term potential gradient. With the help of a circuit diagram, explain how a potentiometer can be used to compare the emfs of two primary cells. How can the sensitivity of a potentiometer be increased? (5)

Q26. Define mutual inductance. Give its S.I. Unit. Derive an expression for the mutual inductance of two long coaxial solenoids of same length wound over the other.

Or

An a.c. source of voltage V =Vm sinwt is connected one by-one to three circuit elements X, Y and Z. It is observed that the current flowing in them,

(i) is in phase with applied voltage for element X

(ii) lags the applied voltage, in phase by $\pi/2$ for element Y

(iii) leads the applied voltage, in phase, by $\pi/2$ for element Z.

Identify the three circuit elements.

Write down the expression for the (a) current flowing in the circuit, (b) net impedance of the circuit, when the same a.c. source is a connected across a series combination of the elements X, Y and Z.

(5)