AECS 4, Rawatbhata Sample Paper for Half yearly Examination-2015

Standard: XII **Subject: Physics**

Time Allowed: 3:00 hr. Max Marks:70

General Instructions

1. All questions are compulsory. There are 26 questions in all.
2. This question paper has five sections: Section A, Section B, Section C, Section D and Section E.
3. Section A contains five questions of one mark each, Section B contains five questions of two marks each, Section C contains twelve questions of three marks each, Section D contains one value based question of four marks and Section E contains three questions of five marks each.
4. There is no overall choice. However, an internal choice has been provided in one question of two marks, one question of three marks and all the three questions of five marks weightage. You have to attempt only one of the choices in such questions.
5. You may use the following values of physical constants wherever necessary

Section A

Q1. What is the value of the angle between the vectors $\vec{P}$ and $\vec{E}$ for which the potential energy of an electric dipole of dipole moment $\vec{p}$, kept in an external electric field , has maximum value.

Q2. Name the colours corresponding to the digits 4 and 7 in the colour code scheme for carbon resistors.

Q3. State which of the two, the capacitor or an inductor, tends to become a SHORT when the frequency of the applied alternating voltage has a very high value.

Q4. Two electric bulbs are marked 220V, 60W and 220 V, 100 W respectively which of the two as the greater resistance?

Q.5. Horizontal component of the earth magnetic field of a place is $\sqrt{3}$ times its vertical component what is the value of angle of dip at that place?

Section B

Q.6. The power factor of an ac circuit is 0.5. What will be the phase difference between voltage and current in this circuit?

Q7 State Kirchhoff's law . Explain briefly how these rules are justified?

Q8 Out of the two magnetic materials, A has relative permeability slightly greater than Unity while B has relative permeability less than unity identify materials .Will their susceptibility be positive or negative

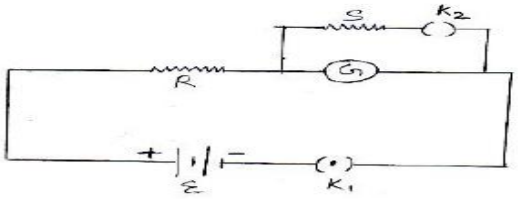
Q9 State underlying principal of a cyclotron . Write briefly how this machine is used to accelerate charged particles to high energies.

Q10. Define rms value of AC derive expression for rms value of AC.

Section C

Q11. Eight identical spherical drops, each carrying a charge 1 μC are at a potential of 900V each. All these drops combine together to form a single large drop. Calculate the potential of this large drop. (Assume no wastage of any kind and take the capacitance of a sphere of radius r as proportional to r).

Q12 . The current flowing in the galvanometer G when the key k2 is kept open is I. On closing the key k_2 , the current in the galvanometer becomes I/n, where n is an integer. Obtain an expression for resistance Rg of the galvanometer in terms of R, S and n. To what form does this expression reduce when the value of R is very large as compared to S?



Q13. The magnitude F of the force between two straight parallel current carrying conductors kept at a distance d apart in air is given by

$$\vec{F} = \frac{\mu_0 I_1 I_2}{2\pi d} \mathbf{l}$$

Where I_1 and I_2 are the currents flowing through the two wires.
Use this expression and the sign convention that the
"Force of attraction is assigned a negative sign and Force of repulsion is assigned a positive sign".

Draw graphs showing dependence of F on
A . $I_1$and I_2 when d is kept constant.
B. d when values of $I_1$and I_2 have constant negative value.
C. d when values of $I_1$and I_2 have constant positive value.

Q.14 Define drift velocity. Derive relation between current and drift velocity.

Q.15 A battery of 2 V is used in potentiometer used for the determination of internal resistance of a 1.5 V cell. The balance point of the cell in open circuit is 76.3 cm. When a resistor of 9.5Ω is used in the external circuit of the cell the balance point shift to $64.8cm$ length of the potentiometer wire. Determine the internal resistance of the cell.

Q.16 What do you mean by mutual induction of two nearby coils? Find an expression for mutual inductance of two co-axial solenoids.

Q.17 Write any three properties of electromagnetic waves.

OR

Find the wave length of electromagnetic waves of frequency $5\times10^{19} Hz$ in free space. Give its two applications.

Q18 If two charges of each 2μC are placed at 3 vertices of equilateral triangle of side 0 cm find net force on one of the charge.

Q19 Derive expression for parallel plate capacitor partly filled with dielectric.

Q20 A battery of 10 V and negligible resistance is connected across the diagonally opposite corner of cubical network consisting of 12 resistor of each 1 ohm . Use Kirchhoff's law to determine
(i). the equivalent resistance of network.
(ii). Total current flows through the network.

Q21. Find PD of that must applied across parallel and series combination of capacitors so that energy stored two combination become same.

Q22. Identify following E.M. waves as per wave length and write an application of each
(i).10^{-3} nm (ii) 2. 10^{-3} m (iii). 1nm

Section D

Q23. Dimpi's class was shown a video on effects of magnetic field on a current carrying straight conductor. She noticed that the force on the straight current carrying conductor becomes zero when it is oriented parallel to the magnetic field and this force becomes maximum when it is perpendicular to the field. She shared this interesting information with her grandfather in the evening. The grandfather could immediately relate it to something similar in real life situations. He explained it to Dimpi that similar things happen in real life too. When we align and orient our thinking and actions in an adaptive and accommodating way, our lives become more peaceful and happy. However, when we adopt an unaccommodating and stubborn attitude, life becomes troubled and miserable. We should therefore always be careful in our response to different situations in life and avoid unnecessary conflicts.

Answer the following question based on above information:

a) Express the force acting on a straight current carrying conductor kept in a magnetic field in vector form. State the rule used to find the direction of this force.
b) Which one value is displayed and conveyed by grandfather as well as Dimpi?
c) Mention one specific situation from your own life which reflects similar values shown by you towards your elders.

Section E

Q24 Explain method to determine specific resistance of wire using meter bridge.

OR

State Whetstones bridge principle and derive it using Kirchhoff's law.

Q25. State gauss theorem in electrostatics. Apply this theorem to obtain the expression for the electric filed at a point due to infinitely long, thin uniformly charged straight wire of linear charge density λcm^{-1}.

OR

With the help of labelled diagram, State the underlying principle of a AC Generator. Explain, its costruction and working .

Q.26 Derive an expression for torque on a rectangular current carrying loop kept in a uniform magnetic field B. Indicate the direction of torque acting on the loop.

OR

State Biot - Sevart law, giving the mathematical expression for it uses this law to derive the expression for the magnetic field due to circular coil carrying current at a point along its axis. How does a circular loop carrying current behave as a magnet?

ATOMIC ENERGY CENTRAL SCHOOL # 4, RAWATBHATA
HALF YEARLY EXAMINATION, (2015-2016)
PHYSICS
CLASS XII
BLUE PRINT

S No	Topics	VSA (1Marks)	SA1 (2 marks)	SA 2 (3 marks)	LA (5 Marks)	TOTAL Marks
1	Electrostatics	1(1)	--	9(3)	5(1)	15(5)
2	Current Electricity	2(2)	2(1)	9(3)	5(1)	18(6)
3	Magnetic Effect Of Current and Magnetism	1(1)	4(2)	3(1)	5(1) 4(1) Value Based	17(6)
4	Electro Magnetic Induction &AC	1(1)	4(2)	9(3)	---	14(6)
5	Electro Magnetic Waves	--	--	6(2)	--	6(2)
	Total	05(05)	10(5)	36(12)	15(3)+4(1)	70(26)