



V. & C. Patel English School

Half Yearly Examination

Date : 13/09/2017

Std. – 12th

Mark-70

Time : 3 Hrs

Sub.: Physics

General Instructions

There are 26 questions in all. All questions are compulsory.

This question paper has five sections: Section A, Section B, Section C, Section D and Section E.

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.

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 choice in such questions.

You may use the following values of physical constants wherever necessary..

$c = 3 \times 10^8 \text{ m/s}$, $h = 6.63 \times 10^{-34} \text{ Js}$, $e = 1.6 \times 10^{-19} \text{ C}$, $\mu_0 = 4\pi \times 10^{-7} \text{ TmA}^{-1}$, $\epsilon_0 = 8.854 \times 10^{-12} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-1}$, $1/4\pi\epsilon_0 = 9 \times 10^9 \text{ Nm}^2 \text{ C}^{-2}$, $m_e = 9.1 \times 10^{-31} \text{ kg}$, mass of neutron $= 1.675 \times 10^{-27} \text{ kg}$, mass of proton $= 1.673 \times 10^{-27} \text{ kg}$, Avogadro's number $= 6.23 \times 10^{23}$ per gram mole, Boltzmann constant $= 1.38 \times 10^{-23} \text{ JK}^{-1}$.

SECTION - A

- 1) Two charges $5\mu\text{C}$ and $-5\mu\text{C}$ are placed at points A and B 2 cm apart. Depict an equipotential surface of two charge system.
- 2) State the principle of production of e.m.waves. What is the value of the velocity of these waves?
- 3) An electric dipole of moment $2 \times 10^{-5} \text{ cm}$ is kept in an enclosed surface. What is the net flux coming out of surface?
- 4) What is the largest voltage you can safely put across a resistor marked 98 ohm-0.5 W?
- 5) Magnetic field arises due to charges in motion. Can a system have magnetic moments even though its net charge is zero?

SECTION - B

- 6) What are diamagnetism and paramagnetism? Can there be a material, which is non-magnetic?
- 7) How are eddy currents produced? Mention two applications of eddy currents.

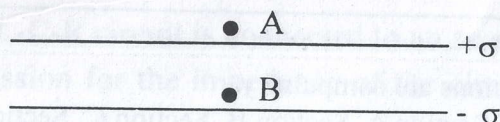
OR. -

State the condition under which the phenomenon of resonance occurs in a series

(P. T. O.)

L-C-R circuit. Plot a graph showing variation of current with frequency of a.c. source in a series LCR circuit.

- 8) Sketch a graph to show how charge Q given to a capacitor of capacity C varies with potential difference V . Prove that the total energy stored in a parallel plate capacitor is $\frac{1}{2}CV^2$.
- 9) Two plane sheets of charge densities $+\sigma$ and $-\sigma$ are kept in air as shown in the fig. What are the electric field intensities at points A and B?



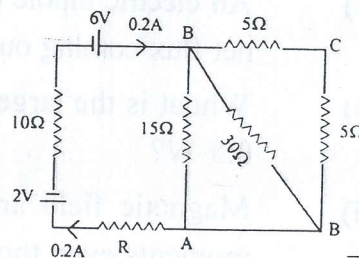
- 10) Find the wave length of EM wave of frequency $5 \times 10^{19} \text{ Hz}$ in Free space. Give its two uses.

SECTION -C

- 11) Prove that an ideal capacitor in an ac circuit does not dissipate power.
- 12) Name the part of electromagnetic spectrum which is suitable for.
- Aircraft navigation
 - Treatment of cancer and tumour.
 - maintain the earth's warmth.
- 13) A uniformly charged conducting sphere of diameter 2.4 m has a surface charge density of $80 \mu\text{C/m}^2$
- Find the charge on a sphere.
 - What is the total electric flux leaving the surface of the sphere?
- 14) A small particle carrying a negative charge of $1.6 \times 10^{-19} \text{ C}$ is suspended in equilibrium between the horizontal metal plates 5 cm apart, having a potential difference of 3000 V across them, find the mass of the particle.

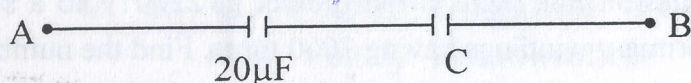
OR

Calculate the value of the resistance R in the circuit in the figure so that the current in the circuit is 0.2 A. what would be the potential difference between points A and B?



- 15) What is Ampere's circuital law? Give derivation for the magnitude of magnetic field of a straight wire using Ampere's law.
- 16) Show that lenz's law is in accordance with the law of conservation of energy. Also explain An induced current has no direction of its own.
- 17) Draw the diagram of wheatstone bridge why does no current flow through the galvanometer when the bridge is balanced?

- 18) Using Biot-Savart's law derive the expression for the magnetic field in the vector or at a point on the axis of a circular current loop.
- 19) The equivalent capacitances of the combination between points A and B in the given figure is $4\mu\text{F}$.



- i) calculate capacitance of the capacitor C.
- ii) Calculate charge on each capacitor if a 12 V battery is connected across terminals A and B.
- iii) What will be the potential drop across each capacitor ?
- 20) (i) Self induction is called the inertia of electricity explain.
(ii) What is the self inductance of a solenoid of length 20 cm area of cross - section 10cm^2 and total number of turns 400?
- 21) Name the elements of the earth's magnetic field at a place. A magnetic needle free to rotate in a vertical plane parallel to the magnetic meridian has its north tip down at 60° with the horizontal. The horizontal component of the earth's magnetic field at the place is known to be 0.4 G. Determine the magnitude of the earth's magnetic field at the place.
- 22) State the underlying principle of a potentiometer. Write two factors on which the sensitivity of potentiometer depends. list two application of potentiometer.

SECTION - D

- 23) Pavan was invited to the birthday party of one of his sister's friend. When he arrived at the party with her sister. He found her sister's friend in a gloomy mood. On inquiry it was found that the person who was supposed to decorate the hall could not come due to some reason. Pavan sent somebody for a packet of balloons. He inflated them, rubbed them on his dry hair and placed them on the wall soon a large number of balloons were on the wall and the hall was decorated.
- (i) Explain how the balloons got 'stuck' with the wall. What is this phenomenon called ?
- (ii) What values are displayed by Pavan ?

SECTION - E

- 24) Describe the working principle of a moving coil galvanometer. Why it is necessary to use radial magnetic field in a galvanometer ? Write the expression for current sensitivity of the galvanometer. Can a galvanometer as such be used for measuring the current ? Explain.

OR -

Explain the phenomenon of hysteresis in magnetic materials what is the significance

of the area of hysteresis loop? Show difference between magnetic hysteresis loop for soft and hard ferromagnetic material.

- 25) (i) Draw a labelled diagram of a step-up transformer. Obtain the ratio of secondary to primary voltage in terms of number of turns and currents in the two coils.
- (ii) A power transmission line feeds input power at 2200 V to a step down transformer with its primary windings having 3000 turns. Find the number of turns in the secondary to get the power output at 220 V.

OR

- (i) A series L-C-R circuit is connected to an ac source. Using phasor diagram, derive the expression for the impedance of the circuit.
- (ii) Plot a graph to show the variation of current with frequency of the source & define Q-factor of the circuit & give its significance.
- 26) State Faraday's law of electromagnetic induction. A rectangular coil of area A, having number of turns 'n' is rotated at 'f' revolutions per second in a uniform magnetic field B, the field being perpendicular to the coil. Prove that the maximum emf induced in the coil is $2\pi f n B A$.

OR

Derive relation between electric current and drift velocity. Hence deduce Ohm's law. Also derive the expression for resistivity in terms of number density of free electrons and relaxation time.

Best of Luck