

# PHYSICS (33)

## II PUC

### MODEL PAPER – 1

Time : 3:15 Hrs.

Max Marks:70

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#### Instructions:

All parts are compulsory.

Answer without relevant diagram / figure/circuit, where ever necessary will not carry any marks.

Direct answers to the numerical problems without the relevant formulae and detailed solutions will not carry any marks.

#### PART – A

I Answer All the questions:

10 x 1 = 10

Define electric potential at a point due to a point charge.

Mention any one application of potentiometer.

An aluminum piece is subjected to varying temperature. What is the effect of temperature on its susceptibility?

How much emf is induced in a coil of self-inductance  $2H$  if the current in it is changing at the rate of  $2As^{-1}$ ?

What is meant by power factor of an ac circuit?

Define polarizing angle for a material.

What are matter waves?

State Heisenberg's uncertainty principle.

Give an example for  $\beta^+$  decay process.

What is a transducer in communication?

#### PART – B

II Answer any FIVE of the following questions:

5 x 2 = 10

Distinguish between polar and non-polar molecules.

Define mobility of electrons. How is mobility of electrons in a conductor related to relaxation time?

Give the expression for gyromagnetic ratio of an electron revolving round the nucleus and explain the terms.

State and explain Faraday's law of electromagnetic induction.

Write the relation between the magnitude of electric and magnetic fields in an electromagnetic wave with speed of light and hence find the magnitude of the electric field at a point in space and time if the magnetic field at that place is  $2 \times 10^{-8}$  T.

What is Doppler Effect in light? Write the expression for Doppler shift.

Define the terms input resistance and current amplification factor of a transistor in CE mode.

Draw the block diagram of AM receiver in communication.

### PART – C

III Answer any FIVE of the following questions:

5 x 3 = 15

Mention any three properties of electric charges.

Derive the expression for magnetic force on a conductor carrying current kept in a magnetic field.

What are eddy currents? Mention any two applications of eddy currents.

Obtain the expression for the current in an AC circuit containing pure capacitor.

What is a transformer? On what principle it works? Mention one power loss in a transformer.

Draw the ray diagram for the formation of image by a compound microscope. What is meant by tube length of a compound microscope?

Mention the three types of electron emission.

What is a NAND gate? Write its circuit symbol and truth table for two inputs.

### PART – D

IV Answer any TWO of the following questions:

2 x 5 = 10

Derive the expression for the capacitance of a parallel plate capacitor. And hence write the expression for the capacitance when a dielectric medium is inserted between its plates.

Obtain the expression for the conductivity of a conductor in terms of its relaxation time. Or

Deduce  $\sigma = \frac{ne^2\tau}{m}$  where the symbols have their usual meaning.

29) Show that a bar magnet behaves as an equivalent current carrying solenoid.

V Answer any TWO of the following questions:

2 x 5 = 10

Obtain the expression for the fringe width of interference fringes in Young's double slit experiment.

31) State the law of radioactive decay. Show that  $N = N_0 e^{-\lambda t}$  for a radioactive element.

What is a rectifier? Explain the working of semi-conductor diode as a full wave rectifier with a necessary circuit diagram. Also give the input and output wave forms for the same

**VI Answer any THREE of the following:**

**3x5=15**

Two pith balls of mass 10mg each are suspended by two threads from the same support are charged identically. They move apart by 0.08m and threads make an angle  $60^\circ$  with each other. Find the charge on each pith ball

- 34) Two cells of 6 V and 4 V having internal resistance of  $3 \Omega$  and  $2 \Omega$  respectively are connected in parallel so as to send a current through an external resistance  $8 \Omega$  in the same direction. Find the current through the cells and the current through the external resistance.

A circular coil of radius 0.08m consisting of 100 turns is carrying a current of 0.4A. Calculate the magnitude of the magnetic field i) at the center of the coil and ii) at a point 0.2m from the center of the coil on its axis.

A parallel beam of light is incident on a face of a prism of refracting angle  $60^\circ$ . Find the refractive index of the prism if the angle of minimum deviation is  $40^\circ$ . What is the new angle of minimum deviation if the prism is immersed in water of refractive index 1.33?

Calculate the value of Rydberg constant if the wavelength of the first member of Balmer series in the hydrogen spectrum is  $6563 \text{ \AA}$ . Also find the wavelength of the first member of Lyman series in the same spectrum.

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# PHYSICS (33)

## MODEL PAPER – 2

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#### PART – A

I Answer All the questions:

10 x 1 = 10

Write the colour code for a carbon resistor of resistance is  $(2.5 \text{ K} \pm 20\%) \Omega$

What is the magnetic moment associated with a current loop of area  $2 \times 10^{-3} \text{ m}^2$  and carrying current of 0.5A?

Which important property differentiates magnetic field lines and electric field lines.

What is meant displacement current?

Mention any one application of  $\gamma$ - ray.

Define critical angle for a pair of media.

Give the expression for de-Broglie wavelength of a charged particle in terms of its accelerating potential.

Represent graphically the variation of photoelectric current with the intensity of incident radiation for a given photo sensitive material.

Give an example for isobars.

Mention one advantage of frequency modulation (FM) over amplitude modulation (AM) in communication.

#### PART – B

II Answer any FIVE of the following:

5 x 2 = 10

Mention any two limitations of Ohm's law.

State Kirchhoff's rules of electrical network.

Define 'tesla' using the expression for the force on a charged particle moving in a magnetic field.

Which are the two properties required for a material to be used as a core of electromagnets.

What are thermal generators? Mention the value of frequency of ac used in India.

Mention any two differences between primary rainbow and secondary rainbow.

What is a light emitting diode? Write an advantage of using it over conventional low power lamps.

Explain the term 'amplification' in communication system. Why is it necessary?

### PART – C

**III Answer any FIVE of the following:**

**5 x 3 = 15**

Derive the expression for torque on an electric dipole placed in a uniform electric field.

What is an equipotential surface? Draw the equipotential surfaces for i) a uniform electric field and ii) a point charge.

Draw the graphs representing the variation of resistivity with temperature for (1) copper (2) nichrome (3) a typical semiconductor.

Define the term 'angle of dip'. Find the value of dip at a place if the vertical component of Earth's magnetic field is  $\sqrt{3}$  times the horizontal component.

23) Show that the charges oscillate with a frequency given by  $\frac{1}{2\pi\sqrt{LC}}$  when a charged capacitor of capacitance C is connected to an inductor of inductance L.

What is meant by diffraction of light? Write the conditions for maxima and minima of diffraction pattern in terms of the wavelength of light used for the diffraction at single slit.

Explain the experimental setup used to study photoelectric effect with a neat labeled diagram.

What are logic gates? Give the logic symbol of NOT and AND gates.

### PART – D

**IV Answer any TWO of the following:**

**2 x 5 = 10**

State Gauss theorem in electrostatics. Derive the expression for electric field at a point due to an infinitely long straight charged conductor.

Derive the expression for the effective emf and the effective internal resistance of two cells connected in parallel.

Describe the construction and working of an AC generator and arrive at the expression for the emf induced in it.

**V Answer any TWO of the following questions:**

**2 x 5 = 10**

30) Derive  $\frac{\mu_r - 1}{\mu_r + 1} \frac{2t}{d}$  for the prism. Where the symbols have their usual meaning.

State Bohr's postulates for atom model. Mention any two limitations of Bohr's atomic model.

With a suitable circuit explain the action of a transistor as an amplifier in CE configuration.

**VI Answer any THREE of the following:**

3x5=15

A 900 pF capacitor is charged by 100 V source. Calculate the electrostatic energy stored in the capacitor? The capacitor is then disconnected from the source and connected to another uncharged 900 pF capacitor. Find the common potential of the system?

A pointer galvanometer with a scale of 30 divisions has a resistance of 12  $\Omega$ . Full scale deflection is obtained for a current of 3 mA. Calculate the current sensitivity of the galvanometer. How will you convert this galvanometer into a voltmeter of range 0 to 18 V?

A resistor and a capacitor are connected in series to a 50 Hz ac source. The voltage (rms) across the resistor and capacitor are 151V and 160.3V respectively. Calculate the rms voltage of the source. Also find the capacitive reactance and impedance of the circuit, if the current in the circuit is 0.755A.

Double-convex lens is to be manufactured from a glass of refractive index 1.55, with both faces of the same radius of curvature. Calculate the radius of curvature required if the focal length is to be 20cm? Also find the focal length of the lens if it is immersed in water of refractive index 1.33?

Calculate the energy released in the reaction

Given: mass of

mass of

mass of

and mass of neutron = 1.008655 amu. Express the result in joules.

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# PHYSICS (33)

## MODEL PAPER – 3

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### Instructions:

All parts are compulsory.

Answer without relevant diagram / figure/circuit, where ever necessary will not carry any marks.

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#### PART – A

#### I Answer All the questions:

10 x 1 = 10

Who discovered the fact that amber rubbed with wool or silk attracts light objects?

Define current density.

What should be the angle between the velocity vector of the charged particle and the magnetic field to experience a maximum force, when a charged particle is moving in a uniform magnetic field?

Write the relation between relative permeability and magnetic susceptibility of a magnetic material.

State Lenz's law in electromagnetic induction.

An elderly person is facing difficulty while reading a book which is about 25cm distance from his eyes. Name the eye defect from which the person is suffering.

Give any one application of Polaroid.

A graph of stopping potential of a photo sensitive metal with the frequency of incident radiation is plotted. What does the slope of this curve represent?

How to get a steady d.c output from the pulsating d.c output of a full wave rectifier?

Represent a typical analogue signal with a diagram

#### PART – B

#### II Answer any FIVE of the following questions:

5 x 2 = 10

Write Coulomb's law in vector form and explain the terms.

Define relaxation time of conduction electrons. How it depends on the temperature of the conductor?

State and explain Gauss law in magnetism.

A coil of self-inductance 2H is carrying a current of 2A. Calculate the energy stored in the coil.

What was Marconi's invention in the field of electromagnetic waves? What for it is used now?

Mention any two methods of increasing the resolving power of a microscope.

What are isotones? Give an example.

A transistor is having a  $\beta$  equal to 80 has a change in base current of  $250\mu\text{A}$ . Calculate the change in the collector current.

**PART – C**

**III Answer any FIVE of the following questions:**

**5 x 3 = 15**

Obtain the expression for electric potential energy of a system of two point charges in the absence of external electric field.

What is a cyclotron? Give the expression for cyclotron frequency and explain the terms.

Mention any three properties of diamagnetic substance.

Derive the expression for emf induced in a straight conductor moving perpendicular to a uniform magnetic field.

What is meant by resonance in a series LCR circuit? Write the expression for the current through LCR series circuit at resonance. Mention any one application of resonant circuits.

Obtain the relation between radius of curvature and focal length of a concave mirror with necessary ray diagram.

Draw the schematic diagram of a nuclear reactor and label its parts. What is the function of a moderator in a nuclear reactor?

Mention the three important reasons which necessitate the process of modulation in communication.

**PART – D**

**IV Answer any TWO of the following questions:**

**2 x 5 = 10**

Derive the expression for electric field at a point outside a charged spherical shell using Gauss law. What is the electric field inside the charged spherical shell?

Obtain the condition for the balance of a Wheatstone's network using Kirchhoff's rules of electrical network.

Deduce the expression for the force between two long parallel conductors carrying steady currents and hence define 'ampere' the S.I. unit of electric current.

**V Answer any TWO of the following questions:**

**2 x 5 =10**

Give the theory of interference of light by considering waves of equal amplitude and hence arrive at the conditions for constructive and destructive interference in terms of path difference.

Derive the expression for the total energy of an electron revolving in the  $n^{\text{th}}$  orbit of hydrogen atom, assuming the expression for the radius of the orbit.

With a necessary diagram explain how a Zener diode works as voltage regulator.

**VI Answer any THREE of the following questions:**

**3x5=15**

A parallel plate capacitor has two plates of dimensions 10 cm x 7 cm separated by a distance of 0.7 mm. A glass plate of thickness 0.4 mm (dielectric constant = 6) and another dielectric medium of thickness 0.3 mm (dielectric constant = 2.5) are placed between the plates of the capacitor. Calculate the capacitance of the capacitor before and after introduction of the dielectric media.

A silver wire has a resistance of  $2.1 \Omega$  at  $27.5^\circ\text{C}$ , and a resistance of  $2.7 \Omega$  at  $100^\circ\text{C}$ . Determine the temperature coefficient of resistivity of silver. Also find the resistance of the silver wire at  $0^\circ\text{C}$ .

A resistor of  $200 \Omega$ , an inductor of  $25 \text{ mH}$  and a capacitor of  $15.0 \mu\text{F}$  are connected in series to a  $220 \text{ V}$ ,  $50 \text{ Hz}$  ac source. Calculate the current through the circuit. Also find the phase difference between the voltage across the source and the current.

A ball is approaching a convex mirror of focal length  $30 \text{ cm}$  with speed  $20 \text{ m/s}$ . Calculate the speed of its image when the ball was at  $5 \text{ m}$  from the mirror?

The threshold wavelength of photo sensitive metal is  $5000 \text{ \AA}$ . Find the velocity of the photoelectrons emitted by it when radiation of wavelength  $4000 \text{ \AA}$  is incident on it. Given  $h = 6.625 \times 10^{-34} \text{ Js}$ ,  $e = 1.6 \times 10^{-19} \text{ C}$  and mass of electron =  $9.1 \times 10^{-31} \text{ kg}$ .

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