

- ❖ State Gauss's law. Find electric intensity due to an infinite sheet of charges.
- ❖ Derive the expression for energy stored in charged capacitor. Also calculate the energy and energy density stored in the electric field.
- ❖ Derive the relation for capacitance of parallel plate capacitor and hence define dielectric coefficient.
- ❖ Define electric potential. Derive the expression for electric potential at a certain point due to a point charge.
- ❖ Define capacitor and capacitance. Derive the formula for energy stored in a capacitor.
- ❖ State and explain ohm's law. Also explain the behavior of ohmic and non-ohmic devices with the help of graph.
- ❖ State Kirchhoff's Rules and explain the voltage rule.
- ❖ What is wheat stone bridge? Give its principle, construction and working. How it can be used to find unknown resistance of a wire?
- ❖ What is potentiometer? Explain its principle and working.

NUMERICALS

- ❖ Two point charges $q_1 = 1.0 \times 10^{-6}C$, $q_2 = 4.0 \times 10^{-6}C$ are separated by distance of 3.0m. Find and justify the zero field location.
- ❖ Determine the electric field at the position $r = (4i + 3j)m$ caused by a point charge $q = 5.0 \times 10^{-6}C$ placed at origin.
- ❖ 0.75A current flows through an iron wire where battery of 1.5V is connected across its terminal (ends).
- ❖ A platinum wire has resistance of 10Ω at $0^\circ C$ and 20Ω at $273^\circ C$. Find the value of temperature coefficient of resistance.
- ❖ The resistance of an iron wire at $0^\circ C$ is $1 \times 10^{-4}\Omega$. what is the resistance at $500^\circ C$ if temperature. Coefficient of resistance of iron $5.2 \times 10^{-3}K^{-1}$
- ❖ The potential difference between the terminals of a battery in open circuit is 2.2V. When it is connected across a resistance of 5Ω . The potential falls 1.8V. Calculate the current and the internal resistance of the battery.
- ❖ Find the electric field strength required to hold suspended a particle of a mass $1.0 \times 10^{-6}kg$ and charge $1.0\mu C$ between two plates 10.0cm apart.
- ❖ A particle having a charge of 20 electron on it falls through a potential difference of 100 volts. Calculate the energy acquired by it an electron volt.

LONG QUESTION NO. 6

QUESTIONS

- ❖ State Ampere's law and find magnetic field (\vec{B}) due to current carrying solenoid.
- ❖ How can you find e/m of an electron? Explain.
- ❖ Derive the expression for torque on current carrying coil in uniform magnetic.
- ❖ What is galvanometer? How it is converted in to:
(a) An Ammeter (b) A Voltmeter
- ❖ State and drive Faraday's law of electromagnetic induction.
- ❖ Derive an expression for the energy stored in an inductor. Also define energy density.
- ❖ Define A.C. generator. Give its principle, construction and working derive an expression for induced emf.
- ❖ What is transformer, derive its equation. Also explain losses and power transmission in it.

NUMERICALS

- ❖ What should pass through a solenoid that is 0.5m long with 10,000 turns of copper wire so that it will have a magnetic field of 0.4T?

- ❖ An ideal step down transformer is connected to main supply of 240V. It is desired to operate a 12V, 30W lamp. Find current in the primary and the transformation ratio.
- ❖ A D.C motor operates at 240V and has a resistance of 0.5Ω when the motor is running at normal speed the armature is 15A. Find the back emf in the armature.
- ❖ A square coil of side 16cm has 200 turns and rotates in a uniform magnetic field of $0.05T$. If the peak emf is 12V. What is the angular velocity of the coil.
- ❖ A coil of 10 turns and 35cm^2 area is in a perpendicular magnetic field of $0.5T$. The coil is pulled out of the field in 1.0sec. Find the induced emf in the coil as it is pulled out of the field.
- ❖ A metal rod of length 25cm is moving at a speed of 0.5ms^{-1} in a direction perpendicular to $0.25T$ magnetic field. Find the emf produced in the rod?
- ❖ A 20.0 cm wire carrying a current of 10.0A is placed in a uniform magnetic field of $0.30T$. If the wire makes an angle of 40° with the direction of magnetic field. Find the magnitude of the force acting on the wire.
- ❖ How fast must a proton moves in a magnetic field of $2.50 \times 10^{-3}T$. Such that magnetic force is equal to its weight.
- ❖ Alpha particles ranging in speed from 1000ms^{-1} to 2000ms^{-1} enter a velocity selector, where the electric intensity is 300Vm^{-1} and magnetic induction is $0.20T$. Which particle will move un-deviated through the field.

LONG QUESTION NO. 7

QUESTIONS

- ❖ Discuss the behavior of an inductor in an A.C circuit and write expression for the inductive reactance.
- ❖ What is an inductor? Derive the relation for energy stored in an inductor.
- ❖ Define impedance. Derive expression for impedance and phase angle in R-C and R-L series circuit excited by A.C voltage.
- ❖ Describe RLC series circuit. Draw its impedance diagram derive the relation for its resonance frequency "f". Also write down its two properties.
- ❖ What are electromagnetic waves? Discuss principle of generation transmission and reception of electromagnetic waves.
- ❖ What is reflection? Explain half wave full wave rectification with diagram.
- ❖ How the transistor can be used as an amplifier? Explain in detail with circuit diagram and calculate gain.
- ❖ What is operational amplifier? Describe the use of op-amp as non-inverting amplifier?
- ❖ What is operational amplifier? Discuss the action of op-amp as inverting and non-inverting amplifier. Also calculate voltage gain in each case.

NUMERICALS

- ❖ An A.C voltmeter reads 250v. What is its peak and instantaneous values if the frequency of alternating voltage is 50 Hz?
- ❖ A $100\mu F$ capacitor is connected to an alternating voltage of 24V and frequency 50Hz calculate. (i) Reactance of Capacitor (ii) Current in circuit
- ❖ Find the value of current flowing through a capacitance $0.5 \mu F$, when connected a source of 150V at 50 Hz.
- ❖ Find the value of current and inductive reactance when A.C voltage of 200 volts at 50 Hz is passed through an inductor of 10H.
- ❖ In a certain circuit the transistor has a collector current 10mA and has current of $40\mu A$. What is the current gain of the transistor?

- ❖ The current flowing into base of a transistor is $100\mu A$. Find its ratio $\frac{I_C}{I_E}$ if the value of current gain β is 100.
- ❖ What is the resonant frequency of a circuit which includes a coil of inductance $2.5H$ and a capacitance $40\mu F$?

LONG QUESTION NO. 8

- ❖ What is meant by strain energy? Draw force extension graph for a vertically suspended wire stretched by a variable weight at the latter end and by its graph derive a relation to calculate its value.
- ❖ What is meant by doping? Give the name of doped materials. How would you n-type and p-type material from pure silicon. Illustrate it by with their schematic diagram.
- ❖ What is energy band theory in solid? Distinguish between conductors insulators and semi conductors on the basis of this theory.
- ❖ Define extrinsic and intrinsic semi-conductors. How can obtain p-type and n-type substance?
- ❖ Write down the postulates of special theory of relativity and also describe the four results of special theory of relativity.
- ❖ Write a note on Compton effect.
- ❖ Discuss photoelectric effect on the basis of classical and quantum theory.
- ❖ Describe de-Broglie's hypothesis and explain its confirmation through Davission and Germer Experiment.
- ❖ State and explain uncertainty principle. Also give its two mathematical forms.

NUMERICALS

- ❖ A 1.25cm diameter cylinder is subjected to a load of 2500 kg. Calculate the stress on the bar in mega Pascal's.
- ❖ What stress would causes A. wire to increase in length by 0.01% if the young modulus of wire is $12 \times 10^{10} Pa$. What force would produce this stress if diameter of the wire is 0.56 mm.
- ❖ A 1.0 m long copper wire is subjected to stretching force and its length increases by 20 cm calculate The tensile strain and the percentage elongation which the wire under goes.
- ❖ The length of steel wire is 1.0m and its cross sectional area is $0.03 \times 10^{-4} m^2$. Calculate the work done in stretching the wire when a force of 100N is applied within the elastic region young's modulus of steel is $3.0 \times 10^{11} m^{-2}$
- ❖ What is mass of a 70 kg man in a space rocket travelling at 0.8c form us as measure form earth?
- ❖ A 90 keV X-rays photon is fired at a carbon target and Compton scattering occurs. Find the wavelength of the accidental photon and the wavelength of the scattered photon of scattering angle of 60° .
- ❖ An electron is placed in box about the size of an atom that is about $1.0 \times 10^{-10} m$. What is the velocity of the electron?
- ❖ An electron is accelerated through a potential difference of 50V. Calculate its de-Broglie's wavelength.

LONG QUESTION NO. 9

- ❖ Calculate the longest wavelength of radiation for the paschen series?
- ❖ Compute the shortest and longest wavelength of radiation for the Lyman series?

- ❖ Give three postulates of Bohr's model and calculate the radius of first orbit of hydrogen atom.
- ❖ What is meant by inner shell transitions and characteristics X-rays? How ray are produced? Write down any two properties and uses of X-rays.
- ❖ Define isotopes. Describe Aston's mass spectrograph and how it can be used to separate the isotopes of an element
- ❖ What is radioactivity? Discuss emission of alpha and beta and gamma radiations from radioactive nuclei
- ❖ Define and explain the principle construction and working of a solid state detector.
- ❖ Describe the principle, construction and working of a Wilson Cloud Chamber.

NUMERICALS

- ❖ If ${}_{92}^{233}U$ decays twice by α –emission what is the resulting isotopes?
- ❖ The half life of ${}_{38}^{91}Sr$ is 9.70 hours. Find its decay constant.
- ❖ A sheet of lead 5.0 mm thick reduces the intensity of a beam of γ – rays by a factor 0.4. Find half value thickness of lead sheet which will reduce the intensity to half of its initial value.
- ❖ A 75kg person receiver a whole body radiation dose of 24 m-rad, delivered by alpha particles for which RBE factor is 12. Calculate:
 - (a) The absorbed energy is joules.
 - (b) The equivalent dose in rem.
- ❖ Find the mass defect and binding energy of the deuteron nucleus, the experiment mass of deuteron is 3.3435×10^{-27} kg.
- ❖ Find the mass defect and the binding energy for Tritium if the atomic mass of tritium is 3.016049μ .
- ❖ Electron in a X-ray tube are accelerated through a potential difference of 3000V. if these electrons were slow down in a target. What will be the minimum wavelength of the X-rays produced?
- ❖ A tungsten target is struck by electrons that have been accelerated from rest through 40kV potential difference. Find the shortest wave length of the bremsstrahlung radiation emitted.