Roll No. _____ (To be filled in by the candidate)

(Academic Sessions 2017 – 2019 to 2019 – 2021)

PHYSICS   221-(INTER PART – II)   Time Allowed : 20 Minutes

Q.PAPER – II (Objective Type)   GROUP – I   Maximum Marks : 17

PAPER CODE = 8471

Note : Four possible answers A, B, C and D to each question are given. The choice which you think is correct, fill that circle in front of that question with Marker or Pen ink in the answer-book. Cutting or filling two or more circles will result in zero mark in that question.

1-1	The quantity $-\dfrac{\Delta V}{\Delta r}$ is called :
	(A) Electric potential (B) Electric energy (C) Potential energy (D) Potential gradient
2	If the potential difference across two plates of capacitor is doubled, the energy in it will be :
	(A) Two times (B) Eight times (C) Four times (D) Remains same
3	Kirchhoff's second rule is a way of stating conservation of :
	(A) Mass (B) Charge (C) Energy (D) Momentum
4	The brightness of spot on CRO screen is controlled by :
	(A) Plates (B) Cathode (C) Anode (D) Grid
5	The e/m of neutron is :
	(A) Less than electron (B) Zero (C) Greater than electron (D) The same as electron
6	The energy stored in inductor is :
	(A) $\dfrac{1}{2}LI^2$ (B) $\dfrac{1}{2}LI$ (C) $\dfrac{1}{2}L^2I$ (D) $\dfrac{1}{2}L^2I^2$
7	The unit of self inductance is :
	(A) Weber (B) Tesla (C) Henry (D) Farad
8	At high frequency the value of reactance of capacitor will be :
	(A) Small (B) Zero (C) Large (D) Infinite
9	When 10 V are applied to an A.C. circuit, the current flowing in it 100 mA, its impedance is :
	(A) 10 Ohm (B) 100 Ohm (C) 1000 Ohm (D) 1 Ohm
10	The critical temperature of mercury is :
	(A) 1.18 K (B) 4.2 K (C) 3.72 K (D) 7.2 K
11	The current gain β of the transistor is given by :
	(A) $\beta = \dfrac{I_B}{I_C}$ (B) $\beta = I_B + I_C$ (C) $\beta = I_B - I_C$ (D) $\beta = \dfrac{I_C}{I_B}$
12	The input resistance of an operational amplifier is :
	(A) Zero (B) Low (C) High (D) Equal to output resistance
13	The value of Plank's constant h is :
	(A) $6.63 \times 10^{-34} Js$ (B) $6.63 \times 10^{-34} J/s$ (C) $6.63 \times 10^{-34} Js^2$ (D) $6.63 \times 10^{-34} J/s^2$
14	Albert Einstein was awarded Noble Prize in Physics in :
	(A) 1905 (B) 1911 (C) 1918 (D) 1921
15	Radius of first Bohr orbit of hydrogen atom is :
	(A) 0.053 nm (B) 0.053 mm (C) 0.053 μm (D) 0.053 m
16	Gamma rays emitted from radioactive element have speed :
	(A) $1 \times 10^7 ms^{-1}$ (B) $1 \times 10^8 ms^{-1}$ (C) $3 \times 10^8 ms^{-1}$ (D) $4 \times 10^{19} ms^{-1}$
17	The dead time of G.M. counter is :
	(A) $10^{-3} s$ (B) $10^{-4} s$ (C) $10^{-6} s$ (D) $10^{-8} s$

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PAPER – II (Essay Type)   GROUP – I   Maximum Marks : 68

SECTION – I

2. **Write short answers to any EIGHT (8) questions :**   16

   (i) If point charge q of mass m is released in a non uniform electric field with field lines pointing in the same direction, will it make a rectilinear motion?

   (ii) Do electrons tend to go to region of high potential or of low potential?

   (iii) Electric field lines provide information about the strength of the electric field. Describe electric field intensity in terms of field lines.

   (iv) Define and write relation for dielectric constant in terms of capacitances of a capacitor.

   (v) Explain the principle of extension of right hand rule.

   (vi) How does the graph pattern appear stationary on the screen of CRO? Explain the condition.

   (vii) Two charged particles are projected into a region where there is a magnetic field perpendicular to their velocities. If the charges are deflected in opposite directions, what can you say about them?

   (viii) If a charged particle moves in a straight line through some region of space, can you say that the magnetic field in the region is zero?

   (ix) What is the importance of minus sign in the expression $\left(\varepsilon = - N \dfrac{\Delta \phi}{\Delta t} \right)$ for Faraday's law of electromagnetic induction?

   (x) Why self induced emf is also called as back emf ?

   (xi) Does the induced emf always act to decrease the magnetic flux through a circuit?

   (xii) Is it possible to change both the area of the loop and the magnetic field passing through the loop and still not have an induced emf in the loop?

3. **Write short answers to any EIGHT (8) questions :**   16

   (i) What is Wheatstone bridge? How can it be used to determine an unknown resistance?

   (ii) Differentiate between resistance and resistivity.

   (iii) Explain why the terminal potential difference of a battery decreases when the current drawn from it is increased?

   (iv) How does doubling the frequency affect the reactance of : (a) An inductor (b) A capacitor

   (v) A sinusoidal current has rms value of 10A. What is the maximum or peak value?

   (vi) Explain the power dissipation in an inductor.

   (vii) What is meant by para, dia and ferromagnetic substances? Give examples of each.

   (viii) What is meant by hysteresis loss? How is it used in the construction of a transformer?

   (ix) Differentiate between young modulus Y and bulk modulus K.

   (x) Why charge carriers are not present in the depletion region?

   (xi) What is the principle of virtual ground? Apply it to find the gain of an inverting amplifier.

   (xii) What is the potential barrier of silicon and germanium?

4. **Write short answers to any SIX (6) questions :**   12

   (i) As a solid is heated and begins to glow, why does it first appear red?

   (ii) Why don't we observe Compton effect with visible light?

(Turn Over)

4. (iii) What advantages an electron microscope has over an optical microscope?

   (iv) What are the advantages of laser over ordinary light?

   (v) What is Helium-Neon Laser?

   (vi) Why are heavy nuclei unstable?

  (vii) What factors make a fusion reaction difficult to achieve?

  (viii) Define mass defect and binding energy.

  (ix) What are hadrons? Give examples.

SECTION – II

Note : Attempt any THREE questions.

5. (a) State Gauss's law. Find out the electric intensity due to an infinite sheet of charge.   5

  (b) 0.75 A current flows through an iron wire when a battery of 1.5 V is connected across its ends. The length of the wire is 5 m and its cross-sectional area is $2.5 \times 10^{-7} m^2$. Compute the resistivity of iron.   3

6. (a) Derive the expression for force on moving charge in a uniform magnetic field.   5

  (b) An alternating current generator operating at 50 Hz has a coil of 200 turns. The coil has an area of 120 cm². What should be the magnetic field in which the coil rotates in order to produce an emf of maximum value of 240 volts?   3

7. (a) How OP amplifier can be made as inverting amplifier? Explain your answer by circuit diagram.   5

  (b) Find the value of the current and inductive reactance when A.C. voltage of 220 V at 50 Hz is passed through an inductor of 10 H.   3

8. (a) Explain the principle, construction and working of Geiger Mullar Counter.   5

  (b) A 1.25 cm diameter cylinder is subjected to a load of 2500 kg. Calculate the stress on the bar in mega pascals.   3

9. (a) State postulates of Bohr's model of the hydrogen atom and then show that hydrogen atom have quantized radii?   5

  (b) An electron is accelerated through a potential difference of 50 V. Calculate its de Broglie wavelength.   3

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PAPER CODE = 8472

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1-1	When some dielectric is inserted between the plates of a capacitor then capacitance :
	(A) Increased (B) Decreased (C) Zero (D) Infinity
2	Coulomb per volt is called :
	(A) Ampere (B) Joule (C) Henry (D) Farad
3	Kirchhoff's first rule is a manifestation of law of conservation of :
	(A) Mass (B) Energy (C) Charge (D) Kinetic energy
4	Work done on a charged particle moving in uniform magnetic field is :
	(A) Maximum (B) Zero (C) Minimum (D) Negative
5	Output wave form of sweep or time base generator is :
	(A) Saw tooth wave (B) Digital wave (C) Sinusoidal wave (D) Square wave
6	Energy stored in the inductor is in the form of :
	(A) Electrical energy (B) Magnetic energy
	(C) Kinetic energy (D) Chemical energy
7	The principle of an electric generator is based upon :
	(A) Ampere's law (B) Faraday's law (C) Coulomb's law (D) Kirchhoff's law
8	The device which allows only flow of A.C. through it is :
	(A) Capacitor (B) Inductor (C) Battery (D) Thermistor
9	S.I unit of impedance is :
	(A) Henry (B) Hertz (C) Ampere (D) Ohm
10	Very weak magnetic field produced by brain can be detected by :
	(A) Compass (B) Metallic needle (C) Squid (D) Liquid
11	If $R_1 = 10 K\Omega$ and $R_2 = 100 K\Omega$ then gain of inverting amplifier is :
	(A) − 11 (B) − 10 (C) 10 (D) 11
12	Automatic functioning of street light can be done by the use of :
	(A) Inductor (B) Capacitor (C) Comparator (D) Thermistor
13	When platinum wire is heated. It changes to cherry red at temperature :
	(A) 500 ^{o}C (B) 900 ^{o}C (C) 1100 ^{o}C (D) 1300 ^{o}C
14	The rest mass energy of an electron positron pair is :
	(A) 0.51 Mev (B) 1.02 Mev (C) 1.2 Mev (D) 1.00 Mev
15	The value of Rydberg constant is :
	(A) $1.0974 \times 10^{7} m^{-1}$ (B) $6.02 \times 10^{-34} m^{-1}$ (C) $3 \times 10^{8} m^{-1}$ (D) $1.6 \times 10^{19} m^{-1}$
16	The half life of uranium -239 is :
	(A) 1620 years (B) 3.8 days (C) 2.5 days (D) 23.5 minutes
17	Binding energy per nucleon is maximum for :
	(A) Helium (B) Iron (C) Radium (D) Polonium

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SECTION – I

2. **Write short answers to any EIGHT (8) questions :**   16

   (i) Is E necessarily zero inside a charged rubber balloon if balloon is spherical? Assume that charge is distributed uniformly over the surface.

   (ii) Do electrons tend to go to region of high potential or of low potential?

   (iii) How a sensitive electric apparatus is shielded from electric fields?

   (iv) Give a comparison of electric and gravitational forces.

   (v) Describe the right hand rule to find the direction of magnetic field inside a current carrying solenoid.

   (vi) Electric force does work, while no work is done by the magnetic force. Why?

   (vii) A plane conducting loop is located in a uniform magnetic field that is directed along the x-axis. For what orientation of the loop is the flux a maximum? For what orientation is the flux a minimum?

   (viii) How can a current loop be used to determine the presence of a magnetic field in a given region of space?

   (ix) How an emf is induced in a coil of wire using a bar magnet?

   (x) Why the self induced emf is sometimes called as back emf ?

   (xi) Does the induced emf always act to decrease the magnetic flux through a circuit?

   (xii) Show that ε and $\dfrac{\Delta\phi}{\Delta t}$ have the same units.

3. **Write short answers to any EIGHT (8) questions :**   16

   (i) Does bends in a wire affect its electrical resistance? Explain.

   (ii) Why does the resistance of a conductor rise with temperature?

   (iii) What is temperature co-efficient of resistance?

   (iv) A sinusoidal current has rms value of 10A. What is the maximum or peak value?

   (v) How many times per second will an incandescent lamp reach maximum brilliance when connected to a 50 Hz source?

   (vi) What are the electromagnetic waves?

   (vii) Write a note on superconductors.

   (viii) What is meant by hysteresis loss? How is it used in the construction of a transformer?

   (ix) Differentiate between N-type and P-type substances.

   (x) Why ordinary silicon diodes do not emit light?

   (xi) Why a photodiode is operated in reverse biased state?

   (xii) What is the working principle of a light emitting diode?

4. **Write short answers to any SIX (6) questions :**   12

   (i) If an electron and proton have the same de Broglie wavelength, which particle has greater speed?

   (ii) Which photon red, green or blue carries the most energy and momentum?

                                                             (Turn Over)

(2)

4. (iii) What are black body radiations?

(iv) What do we mean when we say that the atom is excited?

(v) Is energy conserved when an atom emits a photon of light?

(vi) Describe a brief account of interaction of various types of radiations with matter.

(vii) Why are heavy nuclei unstable?

(viii) What do we mean by term critical mass?

(ix) Differentiate between Baryons and Mesons.

SECTION – II

Note : Attempt any THREE questions.

5. (a) Define capacitance. Derive an expression for the capacitance of a parallel plate capacitor when dielectric is inserted between the plates.　　5

(b) A rectangular bar of iron is 2 cm by 2 cm in cross-sectional area and 40 cm long. Calculate its resistance if the resistivity is $11 \times 10^{-8} \Omega m$.　　3

6. (a) Discuss the principle, construction and working of alternating current generator. Also find expression for induced emf and current.　　5

(b) Find the radius of an orbit of an electron moving at a rate of $2.0 \times 10^{7} ms^{-1}$ in a uniform magnetic field of $2.0 \times 10^{-3} T$.　　3

7. (a) What is the behaviour of A.C. current and voltage in inductor? Discuss power loss through an inductor over a period.　　5

(b) The current flowing into the base of a transistor is 100 μA. Find its collector current I_C, its emitter current I_E and the ratio $\dfrac{I_C}{I_E}$. If the value of current gain β is 100.　　3

8. (a) Describe the principle, construction and working of a Wilson Cloud Chamber.　　5

(b) What stress should cause a wire to increase in length by 0.01%, if the Young's modulus of the wire is $12 \times 10^{10} P.a$? What force would produce this stress if the diameter of the wire is 0.56 mm?　　3

9. (a) What is wave nature of particles? How Davisson and Germer experiment confirmed it?　　5

(b) Find the speed of the electron in the first Bohr orbit.　　3

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