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

(Academic Sessions 2020 – 2022 to 2022 – 2024)

PHYSICS   224-1st Annual-(INTER PART – II)   Time Allowed : 20 Minutes
Q.PAPER – II (Objective Type)   GROUP – I   Maximum Marks : 17
PAPER CODE = 8477   LHR–1–24

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 rest mass energy of electron positron pair is :			
	(A) 0.51 MeV	(B) 0.71 MeV	(C) 1.02 MeV	(D) 2 MeV
2	The SI unit of impedance is :			
	(A) Ohm	(B) Farad	(C) Volt	(D) Ampere
3	To convert galvanometer into voltmeter, high resistance is connected to the galvanometer in :			
	(A) Parallel	(B) Series	(C) Anti parallel	(D) Perpendicular
4	In transistor, concentration of impurity is highest in :			
	(A) Collector	(B) Emitter	(C) Base and collector	(D) Base
5	At high frequency, RLC series circuit behaves like :			
	(A) R-C circuit	(B) R-L circuit	(C) RLC series circuit	(D) L-C circuit
6	If electric and gravitational forces on an electron balance each other, then electric field intensity will be :			
	(A) mgq	(B) $\dfrac{q}{mg}$	(C) $\dfrac{mg}{q}$	(D) $\dfrac{q}{4\pi\varepsilon_o r^2}$
7	The temperature of steam coming out of turbine in nuclear reactor is :			
	(A) 200 °C	(B) 300 °C	(C) 600 °C	(D) 1300 °C
8	The dimensions of motional emf are same as that of :			
	(A) Magnetic induction	(B) Magnetic flux		
	(C) Potential difference	(D) Magnetic force		
9	The value of Stefen's constant 'σ' is given by :			
	(A) $5.67\times10^{-8}\,Wm^{-2}K^{-2}$	(B) $5.67\times10^{-8}\,Wm^{-2}K^{-4}$		
	(C) $5.67\times10^{-8}\,Wm^{2}K^{2}$	(D) $5.67\times10^{-8}\,W^{2}m^{2}K^{-2}$		
10	A charge of 4C is placed in the field of intensity $8NC^{-1}$. The force on the charge is :			
	(A) 2 N	(B) 4 N	(C) 16 N	(D) 32 N
11	The example of crystalline solid is :			
	(A) Zirconia	(B) Natural rubber	(C) Polystrene	(D) Nylon
12	Heat sensitive resistors are called :			
	(A) Resistor	(B) Thermistor	(C) Inductor	(D) Capacitor
13	The atoms can reside in metastable state for about :			
	(A) $10^{-2}s$	(B) $10^{-3}s$	(C) $10^{-4}s$	(D) $10^{-8}s$
14	X = A + B is the mathematical notation for :			
	(A) OR gate	(B) NOR gate	(C) NOT gate	(D) NAND gate
15	Binding energy per nucleon for isotope iron-58 has a value of :			
	(A) 6.6 MeV	(B) 7.7 MeV	(C) 8.8 MeV	(D) 9.9 MeV
16	For step up transformer :			
	(A) $N_s < N_p$	(B) $N_s > N_p$	(C) $N_s = N_p$	(D) $N_s \geq N_p$
17	Brightness of screen of CRO is controlled by :			
	(A) Grid	(B) Anode	(C) Cathode	(D) Filament

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

   (i) Write down dimensions of : (a) Pressure.   (b) Density.

   (ii) Does a dimensional analysis give any information on constant of proportionality that may appear in an algebraic expression?

   (iii) Name two major types of errors.

   (iv) Write down factors of prefixes atto and tera.

   (v) Can magnitude of a vector have a negative value?

   (vi) If $\overline{A} - \overline{B} = \overline{O}$, what can you say about the components of the two vectors?

   (vii) Can you add zero to a null vector?

   (viii) Motion with constant velocity is a special case of motion with constant acceleration. Is this statement true? Discuss.

   (ix) An object is thrown vertically upward. Discuss sign of acceleration due to gravity relative to velocity, while the object is in air.

   (x) How impulse is equal to change in momentum?

   (xi) An object has 1J of potential energy. Explain what does it mean?

   (xii) Prove that $P = \overline{F} . \overline{v}$ where P , $\overline{F}$ and $\overline{v}$ are power, force and velocity.

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

   (i) A wheel covers 200 m distance between two points. If its radius is 0.2 m, find the number of revolution completed by the wheel.

   (ii) Describe what should be the minimum velocity for a satellite, to orbit close to the earth around it.

   (iii) State the direction of the following vectors in simple situations, angular momentum and angular velocity.

   (iv) When mud flies off the tyre of a moving bicycle, in what direction does it fly? Explain.

   (v) A person is standing near a fast moving train. Is there any danger that he will fall towards it?

   (vi) Explain the working of a carburetor of a motorcar using Bernoulli's principle.

   (vii) Time period of a simple pendulum is 2.0 s and amplitude 20 cm, find its maximum speed.

   (viii) What are the conditions of constructive and destructive interference of two sound waves from coherent sources?

   (ix) Can we realize an ideal simple pendulum?

   (x) What is the total distance travelled by an object moving with SHM in a time equal, to its period, if its amplitude is A?

   (xi) Explain the terms : (i) crest.   (ii) antinode.

   (xii) Why does sound travel faster in solids than in gases?

(Turn Over)

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

   (i)   Which principle is helpful to determine the shape and location of new wavefront? Explain briefly.

   (ii)   Explain whether the Young's experiment is an experiment for studying interference or diffraction effects of light.

   (iii)   What are different methods to get polarized light?

   (iv)   What is multimode step index fibre? Explain in short.

   (v)   Draw the ray diagram of compound microscope.

   (vi)   Describe in short the construction and working of collimator.

   (vii)   What will be efficiency of an engine if it performs 100 J of work and rejects 400 J of heat energy to the cold reservoir?

   (viii)   Why the efficiency of real heat engine is always less than one?

   (ix)   Give an example of a process in which no heat is transferred to or from the system but temperature of system changes.

SECTION – II

Note :   **Attempt any THREE questions.**

5. (a) Find resultant of $\bar{A}$ and $\bar{B}$ using addition of vectors by rectangular components.   5

    (b) A football is thrown upward at an angle of $30°$ with respect to horizontal. To throw a 40 m pass what must be the initial speed of the ball?   3

6. (a) How would you describe the analytical approach of formula of absolute P.E., also derive the formula with diagrammatic explanation.   5

    (b) The frequency of the note emitted by a stretched string is 300 Hz. What will be the frequency of this note when the tension is increased by one third without changing the length of the wire?   3

7. (a) Define angular momentum and explain orbital and spin angular momentum.   5

    (b) A block of mass 4.0 kg is dropped from height of 0.80 m on to a spring of spring constant k = 1960 Nm^{-1}. Find the maximum distance through which the spring will be compressed?   3

8. (a) Define pressure of gas. Prove that pressure exerted by the gas is directly proportional to the average translational kinetic energy of the gas molecules.   5

    (b) How large must a heating duct be if air moving along it can replenish the air in a room of 300 m^3 volume every 15 min.? Assume the air's density remains constant.   3

9. (a) Explain Young's Double slit experiment to study the phenomenon of interference of light.   5

    (b) An astronomical telescope having magnifying power of 5 consist of two thin lenses 24 cm apart. Find the focal lengths of the lenses.   3

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	What is the critical temperature of Yttrium Barium Copper Oxide ($YBa_2Cu_3.O_7$) :
	(A) 4.2 K (B) 110 K (C) 163 K (D) 7.2 K
2	One henry (H) is defined as :
	(A) $1H = 1VS^{-1}A^{-1}$ (B) $1H = 1VSA$ (C) $1H = 1VSA^{-1}$ (D) $1H = 1VS^{-1}A$
3	Choose the photon of highest energy among the following :
	(A) X-rays (B) Infrared (C) Radiowaves (D) Gamma rays
4	A particle having a charge of 2e falls through a potential difference of 3V. The energy acquired by it will be :
	(A) 5 eV (B) 1.5 eV (C) 6 eV (D) 0.6 eV
5	SI unit of equivalent dose is :
	(A) Sievert (B) Gray (C) Rad (D) Curie
6	If peak value of AC voltage is 100 V, then the peak to peak value will be :
	(A) 200 V (B) 50 V (C) 70 V (D) 1000 V
7	The direction of magnetic lines of force around a straight current carrying conductor is found by :
	(A) Ampere's law (B) Coulomb's law (C) Lenz's law (D) Right hand rule
8	Which of the following is the correct relation between electric intensity E and potential difference ΔV :
	(A) $E = -\dfrac{\Delta V}{\Delta r}$ (B) $\Delta V = -\dfrac{E}{\Delta r}$ (C) $E = \Delta V + \Delta r$ (D) $E = \dfrac{\Delta V^2}{\Delta r^2}$
9	Which of the following requires no external bias for its operation :
	(A) LED (B) Photo diode (C) Photo-voltaic cell (D) Transistor
10	The energy of K_α X-rays is :
	(A) $hf_{k\alpha} = E_M - E_K$ (B) $hf_{k\alpha} = E_L - E_K$ (C) $hf_{k\alpha} = E_K - E_M$ (D) $hf_{k\alpha} = E_N - E_M$
11	The power factor of a series resonance circuit at resonance frequency is :
	(A) Zero (B) Infinite (C) 2 (D) 1
12	In AVO meter, the part which connects the galvanometer with the relevant measuring circuit is known as :
	(A) Range switch (B) Diode (C) Ground (D) Function selector
13	How much time is required for the complete decay of a radioactive element :
	(A) Five half lives (B) Two half lives (C) Ten half lives (D) Infinite
14	Choose the device which converts electrical energy into mechanical energy :
	(A) Motor (B) Generator (C) Transformer (D) Inductor
15	The current-voltage graph of an ohmic material is :
	(A) Curve (B) Straight line (C) Parabolic (D) Circular
16	The phase shift between the input and output of a common-emitter transistor amplifier is :
	(A) 90° (B) 180° (C) 60° (D) 45°
17	Which of the following factor is called Compton Wavelength :
	(A) $\dfrac{h}{m_o c}$ (B) $\dfrac{m_o c}{h}$ (C) $\dfrac{hc}{m_o}$ (D) $\dfrac{m_o}{hc}$

(Academic Sessions 2020 – 2022 to 2022 – 2024)

PHYSICS 224-1st Annual-(INTER PART – II) Time Allowed : 2.40 hours

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

LHR–2–24

SECTION – I

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

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

(ii) How can you identify that which plate of a capacitor is positively charged?

(iii) Define electric potential. Write its SI unit.

(iv) How Millikan concluded that minimum value of the charge is the charge on an electron?

(v) Why a voltmeter should have a very high resistance?

(vi) Why does the picture on a TV screen become distorted when a magnet is brought near the screen?

(vii) State Ampere's law. Write its mathematical form.

(viii) How the path of electrons is made visible in glass tube to measure e/m ratio?

(ix) What do we mean by the term critical mass?

(x) How can radioactivity help in treatment of cancer?

(xi) How do gamma rays photon interact with matter at low and high energy?

(xii) How did James Chadwick discover a neutron?

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

(i) How can a rheostat be used as a potential divider? Draw also diagram.

(ii) Do bends in a wire affect its electrical resistance? Explain.

(iii) Explain thermistors, their construction and shapes.

(iv) Define inductive reactance and capacitive reactance. Also write mathematical formula of each.

(v) At what frequency will an inductor of 1 H have a reactance of 500 Ω ?

(vi) How reception of a particular radio station is selected on your radio set?

(vii) Give a comparison of crystalline and amorphous solids briefly.

(viii) Differentiate between elasticity and plasticity.

(ix) What is meant by paramagnetic and ferromagnetic substances?

(x) What is the effect of forward biasing and reverse biasing of a diode on the width of depletion region?

(xi) Draw circuit diagram of full wave rectifier.

(xii) Why is the base current in a transistor very small?

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

(i) State the Lenz's law and explain the significance of -ve sign in Faraday's law.

(ii) Does the induced emf always acts to decrease the magnetic flux through a circuit?

(Turn Over)

4. (iii) What is the efficiency of a transformer? Describe methods to increase it.

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

(v) Write two properties of intensity distribution diagram.

(vi) When does the light behave as a particle and when does it behave as a wave?

(vii) Which photon, red, green or blue carries the most (a) energy (b) momentum.

(viii) Bohr's theory of hydrogen atom is based upon several assumptions. Do any of these contradict classical physics?

(ix) Differentiate between spontaneous and stimulated emissions.

SECTION – II

Note : **Attempt any THREE questions.**

5. (a) Derive an expression for the energy stored in a capacitor. 5

(b) 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 the temperature co-efficient of resistance of iron is $5.2 \times 10^{-3} K^{-1}$? 3

6. (a) State Ampere's law. Calculate the magnetic field due to current carrying solenoid. 5

(b) A circular coil has 15 turns of radius 2 cm each. The plane of the coil lies at 40° to the uniform magnetic field of 0.2 T. If the field is increased by 0.5 T in 0.2 s, find the magnitude of induced emf. 3

7. (a) Discuss the behaviour of an inductor in an A.C. circuit and write expression for inductive reactance. 5

(b) In a certain circuit, the transistor has a collector current of 10 mA and a base current of 40µA. What is the current gain of transistor? 3

8. (a) What is meant by strain energy? Derive the relation for strain energy in deformed materials. 5

(b) X-rays of wavelength 22 pm are scattered from a carbon target. The scattered radiation being viewed at 85° to the incident beam. What is Compton Shift? 3

9. (a) How de-Broglie's interpret Bohr's 2nd postulate that an angular momentum is equal to integral multiple of $\dfrac{h}{2\pi}$? 5

(b) 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 of half of its initial value. 3

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	For which material medium, force between two charged particles is maximum :				
	(A) Ammonia	(B) Germanium	(C) Mica	(D) Teflon	
2	The force between two similar unit charges separated one meter apart in air is :				
	(A) Zero	(B) One Newton	(C) $9 \times 10^9 N$	(D) $9 \times 10^{-9} N$	
3	Kirchhoff's 2ⁿᵈ rule is based on :				
	(A) Energy conservation	(B) Mass conservation			
	(C) Charge conservation	(D) Momentum conservation			
4	Which one has least resistance :				
	(A) Galvanometer	(B) Ammeter	(C) Voltmeter	(D) Ohm-meter	
5	A voltmeter is always connected in :				
	(A) Parallel	(B) Series	(C) Perpendicular	(D) Oblique	
6	If we make magnetic field stronger the value of induced current is :				
	(A) Decreased	(B) Increased	(C) Vanishes	(D) Constant	
7	The device which consume electrical energy is called :				
	(A) Generator	(B) Motor	(C) Load	(D) Dissipaters	
8	At high frequency the current through a capacitor of A.C. circuit will be :				
	(A) Small	(B) Infinite	(C) Zero	(D) Large	
9	A.C. through inductor, the applied voltage :				
	(A) Leads the current $\frac{\pi}{2}$	(B) Lags the current $\frac{\pi}{2}$			
	(C) In phase	(D) Out of phase $180°$			
10	The crystalline structure of NaCℓ is :				
	(A) Trigonal	(B) Cubical	(C) Tetragonal	(D) Hexagonal	
11	Minimum diode required for full wave rectifier are :				
	(A) 1	(B) 3	(C) 2	(D) 4	
12	Photovoltaic cell formed from :				
	(A) Arsenic	(B) Carbon	(C) Germanium	(D) Silicon	
13	Unit of Plank's constant is same as that of :				
	(A) Entropy	(B) Angular momentum	(C) Acceleration	(D) Force	
14	Stefen Boltzmann Law is given by :				
	(A) $E = hf$	(B) $E = mc^2$	(C) $E = \sigma T^4$	(D) $\lambda \times T = $ constant	
15	Radiation produced from TV picture tube is :				
	(A) Gamma rays	(B) X-rays	(C) Infrared light	(D) β-rays	
16	What is difference in isotopes :				
	(A) Number of electron	(B) Number of proton			
	(C) Charge number	(D) Number of neutron			
17	A proton consists of quark which are :				
	(A) All up	(B) One up, two down	(C) Two up, one down	(D) All down	

(Academic Sessions 2019 – 2021 to 2021 – 2023)

PHYSICS   223-1st Annual-(INTER PART – II)   Time Allowed : 2.40 hours

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

SECTION – I   LHR-12-1-23

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

  (i) Give similarity and difference between Coulomb and Gravitational forces.

  (ii) Summarize the properties of electric field lines.

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

  (iv) Electric lines of force never cross. Why?

  (v) What is the function of grid in cathode ray oscilloscope?

  (vi) What should be the orientation of current carrying coil in a magnetic field so when the torque maximum acting upon the coil?

  (vii) How can you use a magnetic field to separate isotopes of chemical element?

  (viii) Why the resistance of an ammeter should be very low?

  (ix) Why are heavy nuclei unstable?

  (x) What is the radioactive tracer? Describe one application each in medicine.

  (xi) How can radioactivity help in treatment of cancer?

  (xii) What is meant by absorber dose, also write down the unit of absorber dose?

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

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

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

  (iii) What is a potentiometer, how can it be used to measure the emf of a battery?

  (iv) How the reception of a particular radio station is selected on your radio set?

  (v) What is meant by A.M. and F.M.?

  (vi) Write down the properties of parallel resonance circuit.

  (vii) Distinguish between intrinsic and extrinsic semiconductors.

  (viii) What information is obtained from the area of hysteresis loop?

  (ix) Explain energy band theory.

  (x) Draw diagram, write equation and give truth table of exclusive OR-gate.

  (xi) What is meant by op. amp. as a comparator?

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

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

  (i) Differentiate between mutual induction and mutual inductance.

  (ii) When an electric motor, such as an electric drill, is being used, does it also act as a generator? If so what is the consequence of this?

  (iii) Can an electric motor be used to drive an electric generator with the output from the generator being used to operate the motor?

  (iv) Describe briefly black body radiations.

  (v) Find the mass of a moving object with speed 0.8 c.

4. (vi) Does the dilation means that time really passes more slowly in moving system or that it only seems to pass more slowly?

(vii) Is it possible to create a single electron from energy? Explain.

(viii) How hydrogen spectrum is obtained?

(ix) Can X-rays be reflected, refracted, diffracted and polarized just like any other waves? Explain.

SECTION – II

Note : **Attempt any THREE questions.**

5. (a) Define electric intensity and electric potential. Derive a relation between them. 5

(b) A rectangular bar of iron is 2 cm by 2cm in cross-section and 40 cm long. Calculate its resistance if resistivity is 5.2×10^{-8} Ωm. 3

6. (a) Determine the e/m of electron. How the path of electrons is made visible? 5

(b) A circular coil has 15 turns of radius 2 cm each. The plane of the coil lies at 40° to the uniform magnetic field of 0.2 T. If the field is increased by 0.5 T in 0.2 s, find the magnitude of the induced emf. 3

7. (a) What is meant by rectification? Explain half wave and how full wave rectifiers attain by using bridge rectifier. 5

(b) A 10 mH, 20Ω coil is connected across 240 V and 180 / π Hz source. How much power does it dissipate? 3

8. (a) What is hysteresis loop? Describe the different features of hysteresis loop for a ferromagnetic material. 1,4

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

9. (a) State three postulates of Bohr's model of the hydrogen atom. And describe mathematically the de-Broglie interpretation of Bohr's orbits. 5

(b) Find the mass defect for tritium, if the atomic mass of tritium is 3.016049u. 3

(Academic Sessions 2019 – 2021 to 2021 – 2023)

PHYSICS   223-1ˢᵗ Annual-(INTER PART – II)   Time Allowed : 20 Minute.

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

PAPER CODE = 8478 LHR-12-2-23

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	Wave behaviour of matter is prominent at --- level :
	(A) Macroscopic (B) Mega structure (C) Microscopic (D) Any object size
2	The points where AC crosses the time axis corresponds to phase :
	(A) $\frac{\pi}{2}$ or $3\frac{\pi}{2}$ (B) 0 or π (C) $\frac{\pi}{4}$ or $3\frac{\pi}{4}$ (D) 0 or $\frac{\pi}{2}$
3	A galvanometer coil of resistance Rg gives full scale deflection with current Ig. What is required shunt resistance Rs. = ----- if range of ammeter is I = 2Ig :
	(A) Rg (B) 2 Rg (C) Rg / 2 (D) 4 Rg
4	A combination of two back to back PN junctions is --- :
	(A) Operational amplifier (B) Digital gate (C) Transistor (D) Photo diode
5	The --- work on the principle of beats :
	(A) DC motors (B) Metal detectors (C) Choke coils (D) AC generators
6	1 J = --- eV :
	(A) 1.6×10^{-19} (B) 6.25×10^{18} (C) 9.6×10^{-18} (D) 9×10^9
7	Faraday and Maxwell unified electric and --- force :
	(A) Weak nuclear (B) Strong nuclear (C) Gravitational (D) Magnetic
8	Which is not true for ideal step up transformer :
	(A) $I_s < I_p$ (B) $P_{out} = P_{in}$ (C) $V_s > V_p$ (D) $N_s = N_p$
9	A rod of length ℓ_o in a stationary frame is accelerated at speed of light. Its length measured perpendicular to its direction of motion is :
	(A) $\frac{\ell_o}{2}$ (B) Zero (C) ℓ_o (D) $2\ell_o$
10	The slope of graph between charge and time for capacitor charging is large initially when the product RC is :
	(A) Small (B) Large (C) Intermediate (D) Infinite
11	A ductile wire is stretched to double of its original length, %age elongation is --- :
	(A) 200% (B) 50% (C) 100% (D) 400%
12	The fractional change in resistance is minimum for --- if temperature change is same for all :
	(A) Platinum (B) Nichrome (C) Copper (D) Constanton
13	If ionization energy of hydrogen atom is E_o, the energy required to remove electron from hydrogen in state n = 4 is :
	(A) $\frac{E_o}{4}$ (B) $4E_o$ (C) $\frac{E_o}{16}$ (D) Zero
14	The value of voltage gain of a transistor amplifier (common emitter) is of the order of :
	(A) Thousands (B) Millions (C) Fraction (D) Hundreds
15	Energy required to remove all nucleons from nuclide of --- is maximum :
	(A) Fe^{58} (B) U^{235} (C) Ba^{141} (D) H^2
16	In alternating current, --- behave like resistors :
	(A) Inductors (B) Capacitors (C) Transformers (D) Generators
17	The potential of --- is least in CRO :
	(A) Anode (B) Screen (C) Cathode (D) Grid

(Academic Sessions 2019 – 2021 to 2021 – 2023)

PHYSICS   223-1ˢᵗ Annual-(INTER PART – II)   Time Allowed : 2.40 hours

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

SECTION – I   LHR-12-2-23

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

   (i) · Describe the force or forces on a positive charge when placed between parallel plates with opposite and equal charges.

   (ii) If the distance between two point charges is halved, what will happen to the force between them?

   (iii) What are the factors upon which the electric flux depend?

   (iv) Why does capacitance of a parallel plate capacitor increase in the presence of a dielectric?

   (v) At a given instant, a proton moves in the positive x-direction in a region where there is a magnetic field in the negative z-direction. What is the direction of the magnetic force and direction of motion of proton?

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

   (vii) What is the importance of hair spring used in a Weston galvanometer? Explain.

   (viii) Describe the working of an electron gun in CRO.

   (ix) What is radiation tracer? Explain.

   (x) Which radiation dose would deposit more energy to your body? (a) 10 mGy to your hand or (b) 1 mGy dose to your entire body?

   (xi) How quenching is done in GM-tube?

   (xii) How the scientists dispose off the radioactive waste safely?

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

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

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

   (iii) What is meant by strain energy?

   (iv) What is principle of virtual ground?

   (v) Do bends in a wire affects its electrical resistance? Explain.

   (vi) What is meant by A.M. and F.M.?

   (vii) Define superconductor. Give example.

   (viii) Why is the base current in a transistor is very small?

   (ix) How rheo-state is used as potential divider?

   (x) What is impedance? Give unit.

   (xi) What is elastic limit of material in stress strain curve?

   (xii) Give the application of gates in control system.

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

   (i) Can a D.C motor be turned into DC generator? What changes are required be done?

   (ii) In a transformer, there is no transfer of charge from the primary to the secondary. How is then the power transferred?

   (iii) What is meant by armature?

4. (iv) Can pair production take place in vacuum? Explain.

(v) Will bright light eject more electrons from a metal surface dimmer light of same colour?

(vi) Is it possible to create a single electron from energy? Explain.

(vii) What are black body radiations? How can you get a black body?

(viii) How can the spectrum of hydrogen contain so many lines when hydrogen contains one electron?

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

SECTION – II

Note : **Attempt any THREE questions.**

5. (a) Describe Millikan's oil drop experiment to determine charge on electron.   5

(b) A rectangular bar of iron is 2.0 cm by 2.0 cm in cross-section and 40 cm long. Calculate its resistance if the resistivity of iron is $11 \times 10^{-8} \, \Omega m$.   3

6. (a) Derive the relation of e/m of an electron.   5

(b) An ideal step down transformer is connected to main supply of 240 V. It is desired to operate a 12 V, 30 W lamp. Find the current in the primary and the transformation ratio.   3

7. (a) What is RLC series circuit? Find out an expression for resonance frequency. Also write down its properties.   5

(b) The current flowing into the base of a transistor is $100 \mu A$. Find its collector current and ratio I_C/I_E, if the value of current gain β is 100.   3

8. (a) What is hysteresis loop? Explain different terms, saturation, remanence and coercivity.   5

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

9. (a) What is nuclear fission? Describe uncontrolled and controlled chain reaction.   5

(b) Compute the shortest wavelength radiation in the Balmer Series. What value of n must be used?   3

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	Work done on a charge moving in a uniform magnetic field is :			
	(A) Zero	(B) Positive	(C) Negative	(D) Maximum
2	The most common source of alternating voltage is :			
	(A) Motor	(B) Cell	(C) Generator	(D) Thermocouple
3	Compton effect is associated with :			
	(A) Gamma rays	(B) Beta rays	(C) X-rays	(D) Positive rays
4	Alpha particle carries a charge of :			
	(A) $+2e$	(B) $-2e$	(C) $+e$	(D) Zero
5	The difference of potential energy between two points per unit charge is :			
	(A) Electrical potential	(B) Potential difference	(C) Absolute potential	(D) All of these
6	The devices which are used to convert various physical quantities into electrical voltages are called :			
	(A) Filters	(B) Sensors	(C) Rectifiers	(D) Amplifiers
7	The current flowing through each resistor of equal resistances in parallel combination is :			
	(A) Different	(B) Zero	(C) Same	(D) Infinite
8	The Boolean expression of NAND gate is :			
	(A) $X = A \cdot B$	(B) $X = \bar{A}$	(C) $X = \overline{A.B}$	(D) $X = A + B$
9	Energy released by conversion of 1 amu of mass is :			
	(A) $1.6 \times 10^{-19} ev$	(B) $1.6 \times 10^{-19} Mev$	(C) $200 \, Mev$	(D) $931 \, Mev$
10	The energy stored in the inductor per unit volume is :			
	(A) $\dfrac{B^2}{2\mu_o^2}$	(B) $\dfrac{\mu_o}{2B}$	(C) $\dfrac{\mu_o}{2B^2}$	(D) $\dfrac{B^2}{2\mu_o}$
11	The space between the plates of the capacitor is filled by a dielectric of dielectric constant 'k'. The capacitance of the capacitor :			
	(A) Increased by a factor ' k '	(B) Increased by a factor ' k^2 '		
	(C) Decreased by factor ' k '	(D) Remains unchanged		
12	The mean value of A.C. in one complete cycle is :			
	(A) 1	(B) Zero	(C) I_o	(D) $\dfrac{I_o}{\sqrt{2}}$
13	Unit of self inductance is :			
	(A) Weber	(B) Henry	(C) Tesla	(D) Farad
14	The number of crystal systems are :			
	(A) Three	(B) Five	(C) Fourteen	(D) Seven
15	Beam of electron is also called :			
	(A) X-rays	(B) Alpha rays	(C) Gamma rays	(D) Cathode rays
16	Light emitting diodes (LEDs) are made from semiconductors :			
	(A) Silicon	(B) Germanium	(C) Gallium arsenide	(D) Carbon
17	In electronic transition, atom cannot emit :			
	(A) Infrared radiations	(B) Visible radiations		
	(C) Gamma radiations	(D) Ultraviolet radiations		

(Academic Sessions 2018 – 2020 to 2020 – 2022)

PHYSICS   222-(INTER PART – II)   Time Allowed : 2.40 hours

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

SECTION – I

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

   (i) Write down any two properties of electric field lines.

   (ii) State Coulomb's law and Gauss's law.

   (iii) Suppose that you follow an electric field line due to a positive point charge. Do electric field and the potential increase or decrease?

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

   (v) Define stable or dead beat galvanometer.

   (vi) Differentiate between magnetic flux and magnetic flux density. Also write units of both.

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

   (ix) Differentiate between hadrons and leptons. Also give examples of each.

   (x) Enlist the basic forces of nature.

   (xi) What factors make fusion reaction difficult to achieve?

   (xii) A particle which produces more ionization is less penetrating. Why?

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

   (i) What are the difficulties in testing whether the filament of lighted bulb obeys Ohm's law?

   (ii) Define temperature co-efficient of resistance and write its formula.

   (iii) Prove that : Volt × Ampere = Watt.

   (iv) What is meant by A.M. and F.M.?

   (v) What is the main advantage of three phase A.C. supply?

   (vi) What is difference between A.C. circuit and D.C. circuit?

   (vii) Draw a stress-strain curve for a ductile material and then define the terms :
      (i) Elastic limit.   (ii) Ultimate tensile stress.

  (viii) What are the two main differences between conductors and semi-conductors?

   (ix) Describe energy band picture of insulators.

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

   (xi) Give four applications of a photodiode.

   (xii) How is p-n junction formed?

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

   (i) State Faraday's law of electromagnetic induction.

   (ii) What is back emf effect in motor?

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

(iv) Can an electric motor be used to drive an electric generator with the output from generator being used to operate the motor?

(v) Explain uncertainty principle.

(vi) Write four uses of laser in medicine and industry.

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

(viii) What is the advantage of NAVSTAR navigation system?

(ix) What happens to total radiation from a black body, if its absolute temperature is doubled?

SECTION – II

Note : **Attempt any THREE questions.**

5. (a) What is Wheatstone Bridge? How Wheatstone Bridge can be used to determine an unknown resistance?   1,4

(b) A particle having charge of 20 electrons on it falls through a potential difference of 100 volts. Calculate the energy acquired by it in electron volts (ev).   3

6. (a) How can you determine e/m of an electron? Explain how the path of electron beam is made visible?   5

(b) An emf of 5.6 V is induced in a coil while the current in a nearby coil is decreased from 100 A to 20 A in 0.02s. What is mutual induction of two coils? If secondary coil has 200 turns, find change in flux during this interval.   3

7. (a) Discuss RLC series circuit. Derive the formula for resonance frequency. Also properties of this circuit.   5

(b) The current flowing into the base is 100μA. Find its collector current I_C, its emitter current I_E and I_C / I_E if ' β ' current gain is 100.   3

8. (a) What is energy band theory? Explain the difference amongst electrical behaviour of conductors, insulators and semi-conductors in terms of energy band theory.   5

(b) What is the de-Broglie wavelength of an electron whose kinetic energy is 120eV?   3

9. (a) Derive an expression for the energy of electron revolving in nth orbit of hydrogen atom.   5

(b) A sheet of lead 5 mm thick reduces the intensity of 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.   3

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

(Academic Sessions 2018 – 2020 to 2020 – 2022)

PHYSICS   222-(INTER PART – II)   Time Allowed : 20 Minutes
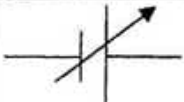Q.PAPER – II (Objective Type)   GROUP – II   Maximum Marks : 17
                          PAPER CODE = 8474   LWR-G2-22

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	$\frac{E}{B}$ has the unit of :			
	(A) meter	(B) ms^{-1}	(C) ms^{-2}	(D) s^{-2}
2	If V_o is peak value of A.C. voltage then mean square value of voltage is :			
	(A) $\frac{V_o}{\sqrt{2}}$	(B) V_o^{2}	(C) $\frac{1}{2}V_o^{2}$	(D) V
3	A black body is both an ideal absorber and an ideal :			
	(A) Reflector	(B) Radiator	(C) Conductor	(D) Insulator
4	Energy given out per nucleon per fission of heavy element like uranium is :			
	(A) 200 MeV	(B) 208 MeV	(C) 5 MeV	(D) 0.9 MeV
5	Electric flux through a closed surface enclosing a charge depends on :			
	(A) Medium	(B) Size	(C) Shape	(D) Location of charge
6	is symbol of :			
	(A) High tension battery	(B) Low tension battery		
	(C) Variable voltage battery	(D) Zero resistance battery		
7	Thermo-couples produce electric energy by :			
	(A) Heat	(B) Chemical energy	(C) Sunlight	(D) Mechanical energy
8	When PN junction is conducting then its resistance is of the order of :			
	(A) Mega Ohm	(B) Kilo Ohm	(C) 100 Ohm	(D) Few Ohms
9	Two quark combination forms :			
	(A) Mesons	(B) Baryons	(C) Leptons	(D) No Composite particle
10	Lenz's law is also a statement of law of conservation of :			
	(A) Linear momentum	(B) Angular momentum	(C) Energy	(D) Charge
11	Unit of electric intensity is same as :			
	(A) Force	(B) Potential gradient	(C) Viscosity	(D) Magnetic field
12	If the frequency of A.C is 40 Hz then current passing through filament bulb get brilliance :			
	(A) 100 times	(B) 80 times	(C) 40 times	(D) 50 times
13	A metal meter rod is moving at the speed of 0.5 ms^{-1} in the direction parallel to a 0.5 T magnetic field, emf will be :			
	(A) 0.25 V	(B) 0.5 V	(C) Zero	(D) 0.125 V
14	In cubical crystal, all the sides meet at :			
	(A) Acute angle	(B) Abtuse angle	(C) Right angle	(D) 45°
15	Work done by a magnetic force of 5 N when a q charge is displaced 2 m is :			
	(A) Non-zero	(B) Zero	(C) 10 J	(D) 5 J
16	The observations on objects moving very fast, approaching the speed of light, are well explained by :			
	(A) Quantum theory	(B) Newton's law		
	(C) Special theory of relativity	(D) Kepler's law		
17	Plank's constant has the unit of :			
	(A) Linear momentum	(B) Angular momentum	(C) Torque	(D) Force

(Academic Sessions 2018 – 2020 to 2020 – 2022)

PHYSICS   222-(INTER PART – II)   Time Allowed : 2.40 hours

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

SECTION – I

LHR-G2-22

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

(i) What is meant by electric polarization?

(ii) Prove that electric intensity in side a hollow charged sphere is zero.

(iii) Electric lines of force never cross each other . Why?

(iv) How can you identify that which plate of the capacitor is positively charged? Explain it.

(v) Write down any four uses of CRO.

(vi) What is Lorentz force? Write down its formula.

(vii) Why does the picture on the TV screen is distorted when a magnet is brought near its screen?

(viii) How a galvanometer can be made sensitive?

(ix) What is the binding energy? Write down the name of element which has highest value.

(x) Heavy nuclei are unstable. Why?

(xi) What do you mean by dead time in Geiger-Muller Counter?

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

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

(i) Write down four sources of current.

(ii) Do bends in a wire affect its electrical resistance? Explain.

(iii) Is the filament resistance lower or higher in a 500 w , 220 volt bulb than in a 100 w, 220 volt bulb?

(iv) Define the terms peak value and peak to peak value.

(v) Discuss two uses of three phase A.C. supply.

(vi) How the reception of a particular radio station is selected on your radio set?

(vii) Explain ductile substances and brittle substances.

(viii) What is meant by hysteresis loss?

(ix) Show that units of modulus of elasticity and stress are the same.

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

(xi) What is the principle of virtual ground?

(xii) Calculate the gain of a non-inverting amplifier. When R_1 = infinity and R_2 = zero

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

(i) Can a step-up transformer increase the power level? Explain.

(ii) How would you position a flat loop of a wire in changing magnetic field, so that there is no emf induced in the loop?

(iii) Write down the factors upon which the mutual inductance depend.

(iv) Distinguish between A.C. generator and transformer.

4. (v) Will higher frequency light eject greater number of electrons than low frequency light?

   (vi) When does light behave as a wave? When does it behave as particle?

   (vii) State Stefen's Boltzman law. Also write the value of Stefen's constant.

   (viii) Find the shortest wavelength of radiation in the Balmer series.

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

SECTION – II

Note : **Attempt any THREE questions.**

5. (a) State and explain Gauss's law, also calculate the electric intensity due to an infinite sheet of charge.   5

   (b) The resistance of an iron wire at $0\ ^{\circ}C$ is $1\times10^{4}\Omega$. What is the resistance at 500 $^{\circ}$C, if the temperature co-efficient of resistance of iron is $5.2\times10^{-3}K^{-1}$?   3

6. (a) State Ampere's law and apply it to find magnetic field due to a current carrying solenoid.   5

   (b) A solenoid has 250 turns and its self inductance is 2.4 mH. What is the flux through each turn when current is 2 A? What is the induced emf when current changes at $20\ As^{-1}$?   3

7. (a) Write a note on transistor as an amplifier.   5

   (b) A circuit has an inductance of $\dfrac{1}{\pi}H$ and resistance of 2000 Ω. A 50 Hz A.C. is supplied to it. Calculate the reactance and impedance offered by the circuit.   3

8. (a) Define photoelectric effect. Give its explanation on the basis of Quantum theory.   5

   (b) A wire 2.5 m long and cross-section area $10^{-5}m^2$ is stretched 1.5 mm by a force of 100 N in the elastic region. Calculate Young's modulus.   3

9. (a) What is laser? Write down its properties and also explain laser action in detail.   5

   (b) Find the mass defect and binding energy of the deuteron nucleus. The experimental mass of deuteron is $3.3435\times10^{-27}kg$.   3

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) $\dfrac{1}{2}L^2 I$ (D) $\dfrac{1}{2}L^2 I^2$
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) $10^{-8} s$

(Academic Sessions 2017 – 2019 to 2019 – 2021)

PHYSICS   221-(INTER PART – II)   Time Allowed : 2.40 hours

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?

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

190-221-I-(Essay Type)-45000

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 – II   Maximum Marks : 17
PAPER CODE = 8472

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	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 $^{\circ}$C	(B) 900 $^{\circ}$C	(C) 1100 $^{\circ}$C	(D) 1300 $^{\circ}$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

(Academic Sessions 2017 – 2019 to 2019 – 2021)

PHYSICS 221-(INTER PART – II) Time Allowed : 2.40 hours
PAPER – II (Essay Type) GROUP – II Maximum Marks : 68

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?

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

227-221-II-(Essay Type)-48000

PHYSICS   219-(INTER PART – II)   Time Allowed : 20 Minutes

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

PAPER CODE = 8477

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 energy of photon is given by :
	(A) $\frac{1}{2}mv^2$ (B) $v_o e$ (C) $m_o c^2$ (D) hf
2	The sum of negative and positive peak values is :
	(A) Average value (B) rms value (C) Peak value (D) p-p value
3	The unit of $\overline{E}$ is NC^{-1} and that of $\overline{B}$ is $NA^{-1}m^{-1}$ then the unit of $\frac{\overline{E}}{\overline{B}}$ is :
	(A) ms^{-2} (B) $m^{-1}s^{-1}$ (C) ms (D) ms^{-1}
4	The common emitter current amplification factor β is given by :
	(A) $\frac{I_C}{I_E}$ (B) $\frac{I_C}{I_B}$ (C) $\frac{I_E}{I_B}$ (D) $\frac{I_B}{I_C}$
5	Resistance in choke is :
	(A) Large (B) Very small (C) Zero (D) Infinite
6	Sec/Ohm is equal to :
	(A) Farad (B) Coulomb (C) Joule (D) Ampere
7	Number of neutrons in $^{235}_{92}U$:
	(A) 92 (B) 235 (C) 143 (D) 327
8	Commutators are used in :
	(A) D.C. generators (B) A.C. generators (C) A.C. motor (D) A.C. rotator
9	The factor $\frac{h}{m_o c}$ in Compton equation has the dimension of :
	(A) Pressure (B) Length (C) Mass (D) Momentum
10	If a charged body is moved against the electric field, it will gain :
	(A) P.E. (B) K.E (C) Mechanical energy (D) Electrical potential energy
11	In p-type substances, the majority charge carriers are :
	(A) Electrons (B) Protons (C) Holes (D) Neutrons
12	When a wire of resistance R is cut into two equal parts then resistance of each wire is :
	(A) Double (B) Half (C) Remain same (D) One forth
13	Energy of the 4th orbit in hydrogen atom is :
	(A) −2.51 eV (B) −3.50 eV (C) −13.6 eV (D) −0.85 eV
14	The gain of non-inverting amplifier is :
	(A) $1+\frac{R_2}{R_1}$ (B) $1+\frac{R_1}{R_2}$ (C) $\frac{-R_2}{R_1}$ (D) $\frac{-R_1}{R_2}$
15	X-rays are the electromagnetic radiations having the wavelength in range :
	(A) $10^{-12}m$ (B) $10^{-10}m$ (C) $10^{-8}m$ (D) $10^{-6}m$
16	To construct a step up transformer :
	(A) $N_s > N_p$ (B) $N_s < N_p$ (C) $N_s = N_p$ (D) $N_s N_p = 1$
17	The magnetic force is simply a :
	(A) Reflecting force (B) Restoring force
	(C) Deflecting force (D) Gravitational force

PHYSICS   219-(INTER PART – II)   Time Allowed : 2.40 hours
PAPER – II (Essay Type)   GROUP – I   Maximum Marks : 68

SECTION – I

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

  (i) State Gauss's law and write its mathematical relation.

  (ii) Define electron volt and show that $1\,eV = 1.6 \times 10^{-19}\,J$.

  (iii) Electric lines of force never cross. Why?

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

  (v) State Lorentz force and write its formula.

  (vi) Write two uses of cathode ray oscilloscope.

  (vii) How can you use a magnetic field to separate isotopes of chemical element?

  (viii) Why the resistance of an ammeter should be very low?

  (ix) How the induced current can be increased?

  (x) What is motional emf and write its mathematical relation?

  (xi) Does the induced emf in a circuit depend on the resistance of the circuit? Explain.

  (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) Define conventional current and solar cell.

  (ii) Define electrolysis and basic principle of electroplating.

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

  (iv) Define peak value and peak to peak value of voltage or current.

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

  (vi) What are superconductors?

  (vii) What is meant by para, diamagnetic substances?

  (viii) What is meant by strain energy?

  (ix) Draw the truth table of XNOR gate.

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

  (xi) Why is the base current in a transistor very small?

  (xii) Define intrinsic and extrinsic semi-conductor.

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

  (i) Will higher frequency light eject greater number of electrons than low frequency light?

  (ii) Photon A has twice the energy of photon B. What is the ratio of momentum of A to that of B?

  (iii) What is the energy of photon in a beam of infrared radiation of wavelength 1240 nm?

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

  (v) Can the electron in ground state of hydrogen absorb a photon of energy 13.6 eV and greater than 13.6 eV?

 (vi) Define the isotopes of an element. Write down the isotopes of hydrogen.

(Turn Over)

4. (vii) What is radioactive decay? Give an example.

    (viii) What factor/make a fusion reaction difficult to achieve?
          does

    (ix) How can radioactivity help in the treatment of cancer?

SECTION – II

Note : **Attempt any THREE questions.**

5. (a) State Gauss's law and apply it to find electric field intensity due to an infinite sheet of charge.   5

   (b) A platinum wire has resistance of 10 Ω at 0 °C and 20 Ω at 273 °C. Find the value of temperature co-efficeint of resistance.   3

6. (a) Define galvanometer. How it is converted into an ammeter and voltmeter?   5

   (b) A pair of adjacent coils has a mutual inductance of 0.75 H. If the current in the primary changes from 0 to 10 A in 0.025 s, what is the average induced emf in the secondary? What is the change in flux in it, if the secondary has 500 turns?   3

7. (a) Discuss the behaviour of an inductor in an A.C. circuit and write an expression for the inductive reactance.   5

   (b) In circuit as shown in fig. there is negligible potential drop between B and E. If β is 100, calculate :   (i) base current.   (ii) collector current.

                 (iii) potential drop across R_c (iv) V_{CE} 3
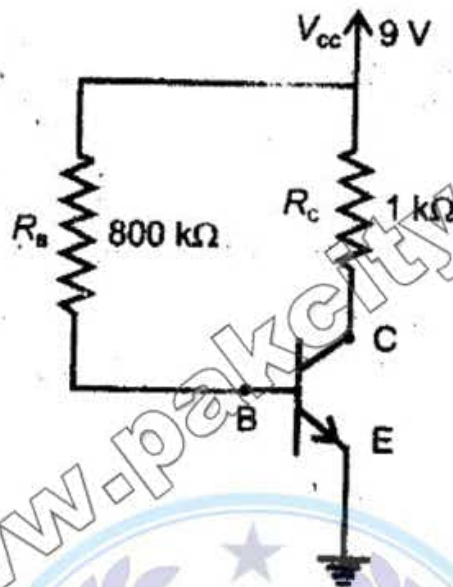
8. (a) Write down the postulates of special theory of relativity. Discuss the relation of time dilation, length contraction, mass variation and energy-mass relation with reference of this theory.   5

   (b) A 1.0 m long copper wire is subjected to stretching force and its length increased by 20 cm. Calculate the percent elongation which the wire undergoes.   3

9. (a) What are inner shell transitions? Describe the production of X-rays and their uses.   5

   (b) How much energy is absorbed by a man of mass 80 kg who receives a lethal whole body equivalent dose of 400 rem in the form of low energy neutrons for which RBE factor is 10?   3

PHYSICS   219-(INTER PART – II)   Time Allowed : 20 Minutes
Q.PAPER – II (Objective Type)   GROUP – II   Maximum Marks : 17
PAPER CODE = 8474

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 value of $\frac{e}{m}$ is smallest for :			
	(A) Proton	(B) Electron	(C) β-particle	(D) Positron
2	At what frequency will an inductor of 1.0 H have a reactance of 500Ω :			
	(A) 50 Hz	(B) 80 Hz	(C) 500 Hz	(D) 1000 Hz
3	The life time of an electron in an excited state is about $10^{-8}s$. What is its uncertainty in energy during this time :			
	(A) $6.63\times10^{-34}J$	(B) $9.1\times10^{-31}J$	(C) $1.05\times10^{-26}J$	(D) $7.2\times10^{-15}J$
4	The binding energy per nucleon is maximum for :			
	(A) Hydrogen	(B) Nitrogen	(C) Uranium	(D) Iron
5	The electrostatic force between two charges is 42 N. If we place a dielectric of $\varepsilon_r = 2.1$ between the charges then the force become equal to :			
	(A) 42 N	(B) 84 N	(C) 20 N	(D) 2 N
6	The Boolean expression of NAND gate is :			
	(A) $X = A.B$	(B) $X = \overline{A}$	(C) $X = \overline{A.B}$	(D) $X = A + B$
7	The value of charge on 1.0×10^7 electrons is :			
	(A) $1.6\times10^{-12}C$	(B) $1.6\times10^{+11}C$	(C) $1.6\times10^{-19}C$	(D) $1.6\times10^{+19}C$
8	Which factor does not affect the conductivity of PN-junction diode :			
	(A) Doping	(B) Temperature	(C) Voltage	(D) Pressure
9	By mass spectrograph we can find the value of mass by using formula :			
	(A) $m = \left(\frac{e^2 r^2}{2V}\right)B^2$	(B) $m = \left(\frac{er^2}{2V}\right)B^2$	(C) $m = \left(\frac{eV}{2r^2}\right)B$	(D) $m = \left(\frac{eV^2}{2r}\right)B$
10	Maximum emf generated in a generator is :			
	(A) $\varepsilon_o = \varepsilon \sin\theta$	(B) $\varepsilon = \varepsilon_o \sin\theta$	(C) $\varepsilon_o = N\omega AB \sin\theta$	(D) $\varepsilon_o = N\omega AB$
11	It is required to suspend a proton of charge 'q' and mass 'm' in an electric field the strength of the field must be :			
	(A) $E = \frac{mg}{qv}$	(B) $E = \frac{mg}{q}$	(C) $E = \frac{q}{mg}$	(D) $E = \frac{qv}{B}$
12	The velocity of an oscillating charge as it moves to and fro along the wire is :			
	(A) Infinite	(B) Constant	(C) Changing	(D) Zero
13	Henry is equal to =			
	(A) VSA^{-1}	(B) $VS^{-1}A$	(C) $V^{-1}S^{-1}A$	(D) $V^{-1}S^{-1}A^{-1}$
14	Good conductors have conductivities of the order of :			
	(A) $10^{-7}(\Omega m)^{-1}$	(B) $10^{7}(\Omega m)^{-1}$	(C) $10^{2}(\Omega m)^{-1}$	(D) $10^{-2}(\Omega m)^{-1}$
15	The unit of $\vec{E}$ is NC^{-1} and that of $\vec{B}$ is $NA^{-1}m^{-1}$ then the unit of $\frac{E}{B}$ is :			
	(A) ms^{-2}	(B) ms	(C) $m^{-1}s^{-1}$	(D) ms^{-1}
16	The numerical value of Stefen's constant is :			
	(A) 5.67×10^{-8}	(B) 2.9×10^{-3}	(C) 6.63×10^{-34}	(D) 1.6×10^{-19}
17	The numerical value of Rydberg's constant is :			
	(A) 1.0974×10^{7}	(B) 1.0974×10^{-7}	(C) 1.0974×10^{14}	(D) 1.0974×10^{-14}

(To be filled in by the candidate)

(Academic Sessions 2015 – 2017 to 2017 – 2019)

PHYSICS   219-(INTER PART – II)   Time Allowed : 2.40 hours

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

SECTION – I

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

  (i) What is electric intensity? What is its SI unit?

  (ii) Show that $\dfrac{1\,volt}{1\,meter} = \dfrac{1\,Newton}{1\,Coulomb}$

  (iii) Describe the force or forces on a positive point charge when placed between parallel plates with similar and equal charges.

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

  (v) Describe the change in the magnetic field inside a solenoid carrying a steady current I, if the length of the solenoid is doubled but the number of turns remains the same.

  (vi) What is CRO? What is the function of grid in CRO?

  (vii) Define ammeter. How can we increase the range of an ammeter?

  (viii) Suppose that a charge q is moving in a uniform magnetic field with a velocity V. Why is there no work done by the magnetic force that acts on the charge q?

  (ix) State Faraday's law of electromagnetic induction and also write expression for it.

  (x) Define mutual inductance of the coils and also define its unit henry.

  (xi) Does the induced emf in a circuit depend on the resistance of the circuit? Does the induced current depend on the resistance of the circuit?

  (xii) In a transformer, there is no transfer of charge from the primary to secondary. How is, then the power transferred?

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

  (i) Define temperature coefficient of resistance and write its formula.

  (ii) A potential difference is applied across the ends of a copper wire. What is the effect on the drift velocity of free electrons by decreasing the length and the temperature of the wire?

  (iii) Is the filament resistance lower or higher in a 500 w, 220 v light bulb than in a 100 w, 220 v?

  (iv) What is impedance? Write its formula.

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

  (vi) What is meant by A.M. and F.M.?

  (vii) Differentiate between ductile and brittle substances.

  (viii) Define stress and strain. What are their SI units?

  (ix) What is meant by hysteresis loss?

  (x) What is depletion region?

  (xi) How does the motion of an electron in a n-type substance differ from the motion of holes in a p-type substance?

  (xii) What is the principle of virtual ground?

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

  (i) Define Compton effect. At what angle Compton shift becomes equal to the Compton wave length?

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

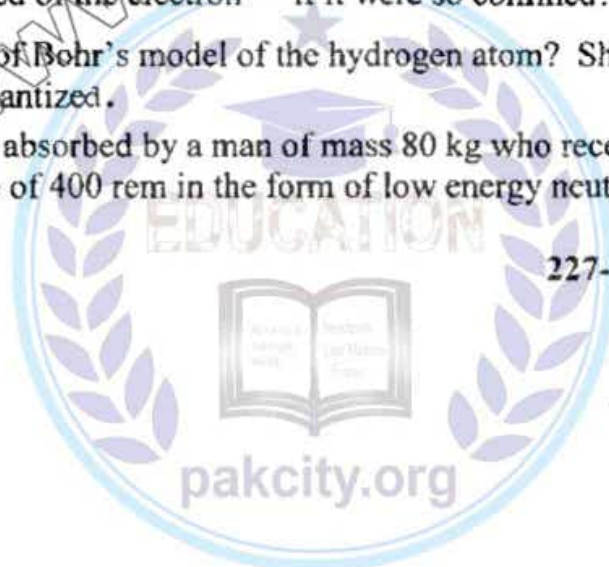 (iii) What happens to radiation energy from a blackbody if its temperature is doubled?

(Turn Over)

4. (iv) Define excitation energy and ionization energy.

  (v) How can spectrum of hydrogen contain so many lines when hydrogen contains one electron? Explain.

  (vi) Can X-rays be reflected, refracted and polarized just like any other waves? Explain.

  (vii) Write down two advantages of solid state detector.

  (viii) Why are heavy nuclei unstable?

  (ix) A particle which produces more ionization is less penetrating. Why?

SECTION – II

Note : **Attempt any THREE questions.**

5. (a) What is Gauss's law? Applying Gauss's law find the electric intensity between two oppositely charged parallel plates.   5

  (b) A rectangular bar of iron is 2.0 cm by 2.0 cm in cross-section and 40 cm long. Calculate the resistance if the resistivity of iron is $11 \times 10^{-8} \Omega m$.   3

6. (a) Derive an expression for torque acting on current carrying coil placed in uniform magnetic field.   5

  (b) A circular coil has 15 turns of radius 2 cm each. The plane of the coil lies at 40° to a uniform magnetic field of 0.2 T. If the field is increased by 0.5 T in 0.2 s, find the magnitude of induced emf?   3

7. (a) Define comparator. Describe how it is used as a night switch?   1,1,3

  (b) A circuit has an inductance of $\frac{1}{\pi} H$ and resistance of 2000Ω. A 50 Hz A.C is supplied to it. Calculate the reactance and impedance offered by the circuit.   3

8. (a) Describe the formation of energy bands in solids. Explain the difference amongst electrical behaviour of conductors, insulators and semiconductors in terms of energy band theory.   5

  (b) An electron is to be confined to a box of the size of the nucleus ($1.0 \times 10^{-14} m$). What would the speed of the electron if it were so confined?   3

9. (a) What are postulates of Bohr's model of the hydrogen atom? Show that energy of hydrogen atom is quantized.   5

  (b) How much energy is absorbed by a man of mass 80 kg who receives a lethal whole body equivalent dose of 400 rem in the form of low energy neutrons for which RBE factor is 10?   3

227-219-II-(Essay Type)-34000

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	If F_1 and F_2 are the magnetic forces acting on α-particle and electron respectively, when moving perpendicular to the magnetic field then :							
	(A) $F_1 = F_2$		(B) $F_1 > F_2$		(C) $F_1 < F_2$		(D) $F_1 = 4F_2$	
2	For non-inverting amplifier, $R_1 = \infty$ and $R_2 = 0$ ohm, the gain of non-inverting amplifier is :							
	(A) – 1		(B) Zero		(C) + 1		(D) Infinite	
3	The half life of Radon is :							
	(A) 23.5 minutes		(B) 3.8 days		(C) 1620 years		(D) 4.5×10^9 years	
4	Lenz's law deals with :							
	(A) Induced emf		(B) Induced current		(C) Power		(D) Electrical energy	
5	Two oppositely charged balls A and B attract the third ball C, when placed near them turn by turn. The third ball C must be :							
	(A) Positively charged		(B) Negatively charged					
	(C) Electrically neutral		(D) Positively and negatively charged					
6	The energy of the photon of wavelength 500 nm is :							
	(A) 3.10 eV		(B) 2.49 eV		(C) 1.77 eV		(D) 1.52 eV	
7	mho m^{-1} is the SI unit of :							
	(A) Conductance		(B) Conductivity		(C) Resistance		(D) Resistivity	
8	The longest wavelength of Paschen series is :							
	(A) 656 nm		(B) 1094 nm		(C) 1875 nm		(D) 2000 nm	
9	The unit of $\sqrt{LC}$ is :							
	(A) Second		(B) Ampere		(C) Hertz		(D) Farad	
10	At what frequency, 1 H inductance offers same impedance as 1μF capacitor :							
	(A) 50 Hz		(B) 159 Hz		(C) 512 Hz		(D) 1590 Hz	
11	The electric potential at a mid-point in an electric dipole is :							
	(A) 0 V		(B) 0.5 V		(C) 1 V		(D) 1.5 V	
12	Very weak magnetic field produced by brain can be detected by :							
	(A) Compass		(B) Metallic needle		(C) Squids		(D) Liquids	
13	If a step-up transformer were 100% efficient, the primary and secondary windings would have the same :							
	(A) Current		(B) Power		(C) Voltage		(D) Direction of winding	
14	The factor $h/m_o C$ in Compton equation has the dimensions of :							
	(A) Pressure		(B) Length		(C) Momentum		(D) Plank constant	
15	When a metal is heated sufficiently electrons are given off by the metal. This phenomenon is known as :							
	(A) Photoelectric effect		(B) Piezo electric effect					
	(C) Thermionic emission		(D) Secondary emission					
16	The mass spectrum of naturally occurring neon shows the most abundant isotope has atomic mass :							
	(A) 19		(B) 20		(C) 21		(D) 22	
17	The wavelength associated with the proton moving at a speed of 40 m/s is :							
	(A) 7.20 nm		(B) 9.02 nm		(C) 15.7 nm		(D) 17.3 nm	

PHYSICS   218-(INTER PART – II)   Time Allowed : 2.40 hours

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

SECTION – I

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

   (i) Prove that Coulomb's law obeys third law of motion.

   (ii) Define potential gradient and give its SI units.

  (iii) Suppose that you follow an electric field line due to a positive point charge. Do electric field and the potential increase or decrease? Explain.

  (iv) Define electric polarization and electric dipole.

   (v) Define electromagnetism and give the name of one device in which electromagnetism is used.

  (vi) State Ampere's law and write it in mathematical form.

 (vii) What is Lorentz force? Write its in mathematical expression

(viii) What is CRO? Write the name of any four main parts of it.

  (ix) Give the two techniques to improve the efficiency of a transformer.

   (x) Define self induction and self inductance.

  (xi) State Faraday's law and write it in mathematical form.

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

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

   (i) Define temperature coefficient of resistance and write its formula.

  (ii) Write two uses of rheostat and draw their diagrams.

  (iii) 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?

  (iv) Define choke and write its advantage in A.C. circuits.

   (v) What is the main advantage of three phase A.C. supply?

  (vi) A sinusoidal current has rms value of 15A. What is the maximum value?

 (vii) Define crystal lattice and give one example.

(viii) Define modulus of elasticity and write its formula.

  (ix) What is meant by strain energy?

   (x) Define open loop gain of an operational amplifier and write its formula.

  (xi) Draw diagram of exclusive OR gate and write its formula.

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

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

   (i) Is it possible for an object to move with speed of light? Justify your answer.

  (ii) What are black body radiations and how can you get a black body?

  (iii) Which photon, red, green or blue carries the most : (a) energy and (b) momentum?

4. (iv) Find the speed of the electron in the first Bohr orbit.

   (v) How can the spectrum of hydrogen contain so many lines, when hydrogen contains one electron?

   (vi) In $^{235}_{92}U$, find : (a) Atomic number   (b) Charge number
              (c) Number of neutrons   (d) Number of electrons

   (vii) What is radioactive decay? Give an example.

   (viii) What information is revealed by the length and shape of the tracks of an incident particle in Wilson cloud chamber?

   (ix) How can radioactivity help in the treatment of cancer?

SECTION – II

Note : Attempt any THREE questions.

5. (a) Derive an expression for the potential at a certain point in the field of a positive point charge.   5

   (b) 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 the temperature co-efficient of resistance of iron is $5.2 \times 10^{-3}\,K^{-1}$?   3

6. (a) What is transformer? Describe its principle, construction and working.   5

   (b) A power line 10.0 m high carries a current 200 A. Find the magnetic field of the wire at the ground.   3

7. (a) Define modulation, electromagnetic waves and in a R-L series circuit. will the current lag or lead the voltage? Illustrate your answer by a vector diagram.   5

   (b) The current flowing into the base of a transistor is 100 μA. Find the ratio I_C/I_E, if the value of current gain β is 100.   3

8. (a) Define stress and strain. What is strain energy? Calculate its value in terms of modulus of elasticity.   5

   (b) What is the de-Broglie wavelength of an electron whose kinetic energy is 120 eV?   3

9. (a) What is meant by inner shell transition and characteristic X-rays? How X-rays are produced? Write down any two properties and uses of X-rays.   5

   (b) A sheet of lead 5 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.   3

(Academic Sessions 2015 – 2017 & 2016 – 2018)

PHYSICS   218-(INTER PART – II)   Time Allowed : 20 Minutes

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

PAPER CODE = 8476

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	Substances which break just after the elastic limit is reached is called as :
	(A) Ductile substances (B) Hard substances
	(C) Brittle substances (D) Soft substances
2	When motor is just started, back emf is almost :
	(A) Maximum (B) Zero (C) Minimum (D) Infinite
3	The photon with energy greater than 1.02 Mev can interact with matter as :
	(A) Photoelectric effect (B) Compton effect
	(C) Pair production (D) Annihilation of matter
4	The unit of electric intensity other than NC^{-1} is :
	(A) V/A (B) V/m (C) V/C (D) N/V
5	The most useful tracer isotopes for the treatment of thyroid glands is :
	(A) Cobalt-60 (B) Carbon-14 (C) Iodine-131 (D) Strontium-90
6	High frequency radio wave is called as :
	(A) Fluctuate wave (B) Carrier wave (C) Matter wave (D) Mechanical wave
7	The S.I. unit of magnetic induction is :
	(A) Weber (B) Tesla (C) Gauss (D) Newton
8	The electric field created by positive point charge is :
	(A) Radially inward (B) Zero (C) Circular (D) Radially outward
9	The Boolean expression of NAND gate is :
	(A) $X = A.B$ (B) $X = \overline{A}$ (C) $X = \overline{A.B}$ (D) $X = A+B$
10	In electron transition from power to higher orbit atom can not emit :
	(A) γ-rays (B) Ultraviolet rays (C) Visible light (D) Infrared
11	The impedance Z can be expressed as :
	(A) $Z = \dfrac{V_{rms}}{I_{rms}}$ (B) $Z = \dfrac{I_{rms}}{V_{rms}}$ (C) $Z = I + V$ (D) $Z = I - V$
12	The value of e/m is smallest for :
	(A) Proton (B) Electron (C) β-particle (D) Positron
13	Nuclear fission chain reaction is controlled by using :
	(A) Steel rods (B) Graphite rods (C) Cadmium rods (D) Platinum rods
14	Henry is S.I. unit of :
	(A) Current (B) Resistance (C) Flux (D) Self induction
15	Resistance tolerance for gold colour is :
	(A) 50% (B) 30% (C) 20% (D) 5%
16	Automatic functioning of street light can be done by the use of :
	(A) Inductor (B) Capacitor (C) Comparator (D) Thermistor
17	The dimension of Planck's constant is same as that of :
	(A) Energy (B) Power (C) Acceleration (D) Angular momentum

(Academic Sessions 2015 – 2017 & 2016 – 2018)

PHYSICS   218-(INTER PART – II)   Time Allowed : 2.40 hours

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

SECTION – I

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

    (i)   What is meant by EEG and ERG?

    (ii) Write any two characteristics of electric field lines.

    (iii) The potential is constant throughout a given region of space. Is the electric field zero or non-zero in this region? Explain.

    (iv) Is it true that Gauss's law states that the total number of lines of force crossing any closed surface in the outward direction is proportional to the net positive charge enclosed within surface? Explain.

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

    (vi) Why does the picture on a T.V. screen become distort   when a magnet is brought near the screen?

    (vii) Is it possible to obtain an isolated north pole? Give reasons.

    (viii) Draw saw tooth voltage waveform and explain it.

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

    (x)   When an electric motor such as an electric drill, is being used, does it also act as a generator? If so what is the consequence of this?

    (xi) What is back motor effect in generators? Explain.

    (xii) Why transformers are used in A.C. supply network?

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

    (i)   What is meant by tolerance? Find the resistance of a resistor with red, green, orange and gold respective bands.

    (ii) What are the difficulties in testing whether the filament of a lighted bulb obeys Ohm's law?

    (iii) Distinguish between resistivity and conductivity.

    (iv) How does doubling the frequency affect the reactance of an inductor?

    (v)   In R-C series circuit, will the current lag or lead the voltage. Illustrate your answer by a vector diagram.

    (vi) Name the device that will permit flow of direct current but oppose the flow of alternating current.

    (vii) Define A.C. current. Make its waveform.

    (viii) Distinguish between p-type semiconductor and n-type semiconductor.

    (ix) What are hard and soft magnetic materials? Give example of each.

    (x)   What is the net charge on a n-type and a p-type substance?

    (xi) How the current flows in forward and reverse biased diode?

    (xii) The input of a gate are 1 and 0 identify the gate if its output is : (a) 0   (b) 1

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

   (i)   If the speed of light were infinite, what would the equations of special theory of relativity reduce to?

(ii) State Heisenberg uncertainty principle. Give its two mathematical forms.

(iii) Which photon red, or blue carries the most   (a) Energy   (b) Momentum

(iv) Is energy conserved when an atom emits a photon of light? Explain.

(v) What is population inversion?

(vi) What is radioactive tracer? Describe one application each in medicine and agriculture.

(vii) Which radiation dose would deposit more energy to your body :
(a) 10 mGy to hand or   (b) 1 mGy to your entire body.

(viii) Write the name of basic forces of nature.

(ix) What is the function of control rods in nuclear reactor?

SECTION – II

Note :   Attempt any THREE questions.

5. (a) State Ohm's law and derive its expression. Discuss why filament of a lighted bulb is non-ohmic by graph. Also give any two examples of non-ohmic devices.   5

(b) A proton is placed in a uniform electric field of 5000 N/C directed to right is allowed to go to a distance of 10.0 cm from point A to the point B. Calculate :
(i) Work done by the field.   (ii) Its velocity.   1 ½ ,1 ½

6. (a) What is inductor? Also derive a formula for energy stored in an inductor.   1,4

(b) A solenoid 15.0 cm long has 300 turns of wire. A current of 5.0 A flows through it. What is the magnitude of magnetic field inside the solenoid?   3

7. (a) Define impedance. Derive an expression for impedance and phase angle in R-C and R-L series circuit excited by A.C. voltage.   1,2,2

(b) Fig. shows a transistor which operates a relay as the switch s is closed. The relay is energized by a current of 10 mA. Calculate the value R_B which will just make the relay operate. The current gain β of the transistor is 200. When the transistor conducts, its V_{BE} can be assumed to be 0.6 V.   3
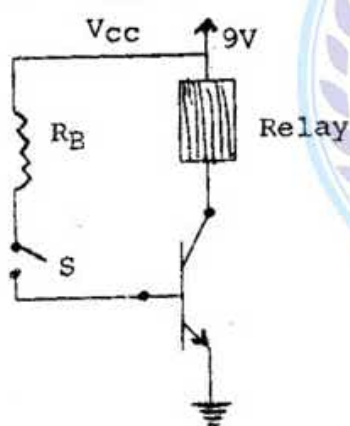
8. (a) What is photoelectric effect? How its different results were successfully explained on the basis of quantum theory?   1,4

(b) The length of a steel bar is 1.0 m and its cross-sectional area is $0.03 \times 10^{-4} m$. Calculate the work done in stretching the wire when a force of 100 N is applied within the elastic region. Young's modulus of steel is $3.0 \times 10^{11} Nm^{-2}$.   3

9. (a) What is inner shell transitions? Explain the production of X-rays.   1,4

(b) Find the mass defect and binding energy for tritium, if the atomic mass of tritium is 3.016049u.   3