PHYSICS HSSC–II

Time allowed: 2:35 Hours   **Total Marks Sections B and C: 68**

SECTION – B (Marks 42)

Q. 2   Answer the following questions briefly.   **(14x3=42)**

(i)	Water has a large dielectric constant, but it is rarely used in capacitors. Why?	03	OR	What is meant by moderator, used in atomic reactors? Give example.	2+1
(ii)	How will capacitance of a parallel plate capacitor be affected if area of plates is doubled and separation between them is halved?	03	OR	What is meant by 'critical mass', 'sub-critical mass' and 'super critical mass' for fission chain reaction?	03
(iii)	How does stator help rotator to rotate in A.C. motor?	03	OR	As rate of doing work increases by motor, the back emf decreases. Why?	03
(iv)	How can a rheostat be used as potential divider? Draw circuit diagram as well.	03	OR	What is meant by alpha factor and beta factor for common emitter configuration of transistor? Give relation between them.	03
(v)	Calculate the current flowing through a circuit of resistance 1500 ohm connected with a battery of emf 100V with internal resistance 0.01 Ohm.	03	OR	Briefly explain the terms 'magnetic flux' and 'magnetic flux density'? Give their units as well.	03
(vi)	Can an electron at rest be set in motion with a magnet? Explain briefly.	1+2	OR	Differentiate between spontaneous and stimulated emissions. Also show in diagrams.	03
(vii)	What is the time period of an electron projected into a uniform magnetic field of 20mT and moves in a circle of radius 6cm?	03	OR	Why is common emitter configuration of transistor widely used in amplifier circuits?	03
(viii)	What is choke coil? Give its importance in A.C. circuits.	1+2	OR	How are eddy currents produced? Identify their heating effects.	03
(ix)	What determines the gradient of a graph of inductive reactance against frequency? Explain briefly.	03	OR	Write Stefan-Boltzmann law for black body radiation. Give its mathematical expression as well.	2+1
(x)	Differentiate, between 'critical temperature' and 'curie temperature' with examples.	03	OR	How a galvanometer can be converted into ammeter? Explain with the help of diagram also derive formula.	03
(xi)	Why in a transistor, the base is thin and lightly doped? Explain briefly.	03	OR	A 24.0V car battery powers a 30.0 watt bulb. How many charges pass through it, in each second?	03
(xii)	Which factors cause to produce magnetic field in an atom? Explain briefly.	03	OR	How did De-Broglie prove the third postulate of Bohr's atomic model? Explain briefly.	03
(xiii)	Under what condition Compton shift has maximum wavelength. Also calculate Compton shift wavelength.	1+2	OR	What is meant by depletion layer in PN-Junction? How is it developed? Explain briefly.	2+1
(xiv)	When a solid is heated it begins to glow, why does it first appear red?	03	OR	How many basic forces of nature exist? Describe any two briefly.	1+2

SECTION – C (Marks 26)

Note: Attempt the following questions.

Q.3	Explain the concept of electric potential. Derive an expression for electric potential at a point in electric field due to a point charge.	1+6	OR	State postulates of Bohr's atomic model. Show that radii of the orbit of H-atom are quantized.	3+4
Q.4	What is meant by emf (ε), internal resistance(r) and terminal potential difference(V_t) of a battery? Derive relation between them. Under what condition $V_t > \varepsilon$?	3+3+1	OR	What is AC generator? How is an AC generator used to produce an alternating current? Derive mathematical expression of A.C. Also show it graphically.	1+2+4
Q.5	The Half life of Radium is $5.0 \times 10^{10} S$. A sample contains 6.0×10^{16} nuclei. Calculate. a. Decay constant. b. How many radium nuclei will decay per second? Express your answer in curies.	2+2+2	OR	A sinusoidal alternating voltage of angular frequency ω is connected across a capacitor C. Find mathematical expression for instantaneous voltage, current and average power dissipated per cycle of applied voltage.	06
Q.6	Explain the phenomena of pair production and pair annihilation.	06	OR	Describe the magnetic properties of material explained on the basis of B-H curve.	06

(D) ——

ε_r for water $= 80$	$C = \dfrac{A\varepsilon_o \varepsilon_r}{d}$	$F = \dfrac{mv^2}{r}$	$IR = \varepsilon - Ir$	$F = q(V \times B)$	$v = \dfrac{s}{t} = \dfrac{2\pi r}{T}$	$X_L = 2\pi f L$
$I = \dfrac{Q}{t}$	$\Delta\lambda = \dfrac{h}{m_o c}(1 - \cos\theta)$	$\lambda = \dfrac{0.693}{T_{\frac{1}{2}}}$	$A = \lambda N$	$1 Bq = \dfrac{Ci}{3.70 \times 10^{10}}$	$mvr = \dfrac{nh}{2\pi}$
$P = VI$	$c = 3 \times 10^8 ms^{-1}$	$h = 6.626 \times 10^{-34} Js$	$m_o = 9.1 \times 10^{-31} kg$		

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SECTION – B (Marks 42)

Q. 2   Answer the following questions briefly.   **(14x3=42)**

(i)	What is meant by 'Magnetic Flux' and 'Magnetic Flux density'? Also give their units.	03	OR	Why energy dissipated per cycle (magnetization and demagnetization). For steel is more as compared to iron? Explain briefly. **03**
(ii)	What is Wein's displacement law? Explain briefly.	1+2	OR	Prove that $E = -\dfrac{\Delta V}{\Delta r}$ **03**
(iii)	Differentiate between controlled and uncontrolled nuclear chain reactions. How is the chain reaction controlled?	03	OR	Why in a transistor the base region is made thin and lightly doped? **03**
(iv)	Distinguish between N-type semiconductor and P-type semiconductor.	03	OR	Calculate the longest wave length of radiation for the Lyman series of hydrogen spectra. **03**
(v)	Differentiate "Curie temperature" and "Critical temperature".	03	OR	How capacitor discharge ignition system works? Enlist some of its uses. **2+1**
(vi)	Briefly explain resistivity. How it depends on temperature?	1+2	OR	How can a galvanometer be converted into voltmeter? Draw circuit diagram as well. **2+1**
(vii)	How are eddy currents produced? Identify their heating effects.	03	OR	How Geiger-Muller counter detects and counts radiation? **03**
(viii)	In transformer, why laminated iron core is used instead of solid one?	03	OR	A coil having a resistance of 10 Ohm and an inductance of 32mH is connected to 220V, 50Hz AC supply. Calculate current passing through the coil. **03**
(ix)	What is meant by peak value and effective value of sinusoidal current? Give relation between them.	03	OR	Differentiate Paramagnetic and Diamagnetic materials with one example each. **03**
(x)	Briefly explain working of transistor as a switch.	03	OR	What is meant by Meta-stable state and population inversion for LASER action? **03**
(xi)	Calculate De-Broglie wave length of an electron having KE=1200 kev.	03	OR	Discuss the difference between Hadrons and Leptons. **03**
(xii)	How much energy is released when 0.5kg of U-235 undergoes fission reaction? (If the disintegration energy per event is Q=208Mev.)	03	OR	What is meant by Alpha factor and Beta factor for common emitter configuration of transistor? Derive relation between them. **03**
(xiii)	Briefly explain the principle of metal detector with circuit diagram.	2+1	OR	What is electron volt(ev)? Derive its relation with SI unit of energy. **1+2**
(xiv)	Under what condition a source (Battery or cell) gives maximum power output? Discuss briefly.	03	OR	State Lenz's law. Prove that it is according to law of conservation of energy. **1+2**

SECTION – C (Marks 26)

Note: Attempt the following questions.

Q.3	State postulates of Bohr's atomic model. Show that energy of the electron in H-atom is quantized.	3+4	OR	Derive an expression for charge to mass ratio for an electron and then calculate its value. **5+2**
Q.4	What is photoelectric effect? Why classical physics fails to explain photoelectric effect? Derive Einstein photoelectric equation.	1+2+4	OR	What is potentiometer? Explain its principle, construction and working. Also give some uses. **1+5+1**
Q.5	State and explain Gauss's law. Find electric field intensity between two oppositely charged parallel plates.	3+3	OR	Explain the phenomenon of self-inductance of a coil. What is its unit? On what factors self-induction depends? **3+1+2**
Q.6	What is RLC series resonance circuit? Draw its impedance diagram. Also give its properties.	2+1+3	OR	What is meant by 'half-life' of a radio-active element? Show that $T_{\frac{1}{2}} = 0.693/\lambda$ **2+4**

$\dfrac{1}{\lambda} = R_H\left(\dfrac{1}{p^2} - \dfrac{1}{n^2}\right)$ $X_L = 2\pi fL$ $\lambda = \dfrac{h}{mv}$ $KE = \dfrac{1}{2}mv^2$ $R_H = 1.0974 \times 10^7 m^{-1}$ $Z = \sqrt{R_2 + X_L^2}$ $N = \dfrac{N_A \times m}{A}$

$h = 6.626 \times 10^{-34} Js$ $I = \dfrac{V}{Z}$ $N_A = 6.023 \times 10^{23}$ $E = PQ$ $m_e = 9.1 \times 10^{-31} kg$ $A = Z + N$ $E = N \times Q$