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 $= 80$ $\quad C = \frac{A\varepsilon_o\varepsilon_r}{d}$ $\quad F = \frac{mv^2}{r}$ $\quad IR = \varepsilon - Ir$ $\quad F = q(V \times B)$ $\quad v = \frac{s}{t} = \frac{2\pi r}{T}$ $\quad X_L = 2\pi fL$

$I = \frac{Q}{t}$ $\quad \Delta\lambda = \frac{h}{m_o c}(1 - \cos\theta)$ $\quad \lambda = \frac{0.693}{T_{\frac{1}{2}}}$ $\quad A = \lambda N$ $\quad 1Bq = \frac{Ci}{3.70 \times 10^{10}}$ $\quad mvr = \frac{nh}{2\pi}$

$P = VI$ $\quad c = 3 \times 10^8 ms^{-1}$ $\quad h = 6.626 \times 10^{-34} Js$ $\quad m_o = 9.1 \times 10^{-31} kg$