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Version No.			
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ROLL NUMBER					

PHYSICS HSSC-II

SECTION – A (Marks 17)

Time allowed: 25 Minutes

Section – A is compulsory. All parts of this section are to be answered on this page and handed over to the Centre Superintendent. Deleting/overwriting is not allowed.

Do not use lead pencil.

حصہ اول لازمی ہے۔ اس کے جوابات اسی صفحہ پر دے کر نا ظم مرکز کے حوالے کریں۔ کاٹ کر دوبارہ لکھنے کی اجازت نہیں ہے۔ لیڈ پنسل کا استعمال ممنوع ہے۔

Answer Sheet No. _____

ہر سوال کے سامنے دیے گئے، کریکولم کے مطابق درست دائرہ کو پر کریں۔ **Invigilator Sign.** _____

Fill the relevant bubble against each question according to curriculum: **Candidate Sign.** _____

	Question	A	B	C	D	A	B	C	D
1.	Sum of the masses of constituent nucleons as compared to the mass of the resultant nucleus is:	Negligible	Smaller	Greater	Same	○	○	○	○
2.	In the time constant of RC circuit, how much charge is stored, out of maximum charge q_o?	$0.90q_o$	$0.37q_o$	$0.51q_o$	$0.63q_o$	○	○	○	○
3.	The electric field at a distance of $20cm$ from $4\mu c$ charge is:	$9\times10^5 N/C$	$4.5\times10^5 N/C$	$3\times10^3 N/C$	$9\times10^3 N/C$	○	○	○	○
4.	For a closed circuit:	$E=V_t-Ir$	$E=V_t$	$E>V_t$	$E<V_t$	○	○	○	○
5.	Resistance of a wire is 'r' ohms. The wire is stretched to four times its length, then its resistance in ohms is:	$r/4$	$r/2$	$8r$	$4r$	○	○	○	○
6.	If a charge is at rest in a magnetic field, then the magnetic force on charge is:	Zero	qvB	$qvB\cos\theta$	$qvB\sin\theta$	○	○	○	○
7.	A $2m$ wire carrying current $5A$ is at right angle to uniform magnetic field of $0.2 web/m^2$. The force on wire will be:	$1.5N$	$2N$	$4N$	$5N$	○	○	○	○
8.	The Component in generator which consumes energy is called:	Capacitor	Commutator	Split rings	Load	○	○	○	○
9.	The circuit in which current and voltage are in phase, the power factor is:	2	Zero	1	-1	○	○	○	○
10.	An alternating voltage is given by $30\sin157t$ the frequency of alternating voltage is:	$75Hz$	$50Hz$	$25Hz$	$100Hz$	○	○	○	○
11.	Which of the following is the Young Modulus of steel?	$1.5\times10^9 N/m^2$	$2\times10^{11} N/m^2$	$3.9\times10^{-9} N/m^2$	$2\times10^9 N/m^2$	○	○	○	○
12.	A wire is stretched to four times of its length its strain is:	0.5	4	3	1	○	○	○	○
13.	A potential barrier of $0.7 volt$ exists across P-N junction made from:	Gallium	Silicon	Germinium	Indium	○	○	○	○
14.	The minimum energy required by a photon to create an electron-positron pair is:	$0.051MeV$	$0.52MeV$	$1.51MeV$	$1.02MeV$	○	○	○	○
15.	According to de-Broglie equation _____ has the smallest wavelength associated with it.	Electron	Proton	Neutron	Alpha particle	○	○	○	○
16.	If an atom exists in excited state $n=3$, the number of transitions that take place is:	25	3	5	10	○	○	○	○
17.	The duration of meta stable state is approximately:	$10^{-10}S$	$10^{-3}S$	$10^{-6}S$	$10^{-8}S$	○	○	○	○

- $E=\frac{q}{4\pi\varepsilon_o r^2}$
- $R=\frac{\rho L}{A}$
- $F=qvB\sin\theta$
- $F=BIL\sin\theta$
- $P=VI\cos\theta$
- $N=\frac{n(n-1)}{2}$
- $E_o=m_oc^2$
- $\lambda=\frac{h}{mv}$
- $V=V_o\sin\omega t$
- $\frac{\Delta L}{L}=\frac{4}{1}=4$

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PHYSICS HSSC–II

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

NOTE: Answer any fourteen parts from Section 'B' and any two questions from Section 'C'. Write your answers neatly and legibly.

SECTION – B (Marks 42)

Q. 2 Attempt any FOURTEEN parts. All parts carry equal marks. **(14 x 3 = 42)**

(i) Show that 'electric field' is 'potential gradient' $\left(E=\frac{\Delta V}{d}\right)$.

(ii) What is "electron volt"? Show its relationship with joule.

(iii) How can a rheostat be used as potential divider?

(iv) A heating coil has a resistance of 10Ω, It is designed to operate on $220V$, what electric energy in joules is supplied to heater in 20 seconds?

(v) Why low resistance in an ammeter is called shunt resistance? Why is this 'shunt' connected parallel to galvanometer?

(vi) Is it possible to accelerate a neutron in cyclotron (Magnetic field)? Justify your answer.

(vii) Briefly explain the need of laminated iron cores in transformers.

(viii) In a coil, current changes from $6A$ to $8A$ in $0.05S$. If the average E.M.F is $10V$, then find the coefficient of self-inductance.

(ix) How can radiowaves be produced? Describe that information can be transmitted by radiowaves.

(x) An inductor with an inductance of $100\mu H$, passes a current of $5mA$ when its terminal potential is $8V$ Calculate the frequency of A.C supply.

(xi) Highlight the importance of super conductors in MRI machine.

(xii) Differentiate 'elastic deformation' and 'plastic deformation'.

(xiii) Under what conditions a transistor acts as open and a closed switch?

(xiv) Briefly explain how electrons and holes flow across a P-N junction.

(xv) Should the rest mass of photon be zero? Justify your answer.

(xvi) Briefly explain the following terms:

(a) Unified Mass Scale **(b)** Mass Defect

(xvii) Differentiate between excitation potential and ionization energy?

(xviii) The inner shell transitions in heavy elements result into emission of characteristic X-Rays. How do these X-Rays differ from visible light?

(xix) Describe any two basic forces of nature.

(xx) Does fusion reaction release more energy per nucleon than fission reaction? Explain briefly.

SECTION – C (Marks 26)

Note: Attempt any TWO questions. All questions carry equal marks. **(2 x 13 = 26)**

Q. 3 a. Derive an expression for energy stored in capacitor.

b. The full-scale deflection of galvanometer is $10mA$; its resistance is 50Ω. How can it be converted into an ammeter of range $200A$?

Q. 4 a. What is meant by motional emf? Also derive an expression for motional emf.

b. An A.C circuit consists of a pure resistance of 10Ω and is connected across an A.C supply of $220V$, $100Hz$. Calculate:

(i) Current **(ii)** Power consumed **(iii)** Equation for voltage.

Q. 5 a. What is de Broglie's hypothesis? Describe an experiment to show that a particle can have wave characteristics.

b. Find the wave length associated with an electron in the state $n=3$ of the hydrogen atom.

Important formulae

- $E=\frac{\Delta V}{d}$
- $W=I^2Rt$
- $E=\frac{L\Delta I}{\Delta t}$
- $X_L=2\pi fL$
- $I=\frac{V}{X_L}$
- $\frac{1}{\lambda_n}=\frac{1}{R_H}\left(\frac{1}{p^2}-\frac{1}{n^2}\right)$
- $\lambda_{max}=\frac{\text{Constant}}{T}$
- Wein's Constant $=0.2898\times10^{-2}mk$
- $W=\frac{1}{2}QV$
- $W=\frac{1}{2}CV^2$
- $R_s=\frac{I_gR_g}{(I-I_g)}$

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ROLL NUMBER					

PHYSICS HSSC-II

SECTION – A (Marks 17)

Time allowed: 25 Minutes

Section – A is compulsory. All parts of this section are to be answered on this page and handed over to the Centre Superintendent. Deleting/overwriting is not allowed.

Do not use lead pencil.

حصہ اول لازمی ہے۔ اس کے جوابات اسی صفحہ پر دے کر ناظم مرکز کے حوالے کریں۔ کاٹ کر دوبارہ لکھنے کی اجازت نہیں ہے۔ لیڈ پنسل کا استعمال ممنوع ہے۔

Answer Sheet No. _____

ہر سوال کے سامنے دیے گئے، کریکولم کے مطابق درست دائرہ کو پر کریں۔ **Invigilator Sign.** _____

Fill the relevant bubble against each question according to curriculum: **Candidate Sign.** _____

	Question	A	B	C	D	A	B	C	D
1.	According to de-Broglie equation which one has **smallest** wavelength associated with it?	Neutron	α – Particle	Electron	Proton	○	○	○	○
2.	The energy of electron in the excited state $n=3$ in hydrogen atom is:	$-3.4eV$	$-0.85eV$	$-1.5eV$	$-13.6eV$	○	○	○	○
3.	Unit of decay constant 'λ' is:	m^{-1}	S	S^{-1}	m	○	○	○	○
4.	A $2\mu F$ capacitor of a television is subjected to $4000V$ potential difference. The energy stored in capacitor is:	$16J$	$4\times10^{-3}J$	$2\times10^{-3}J$	$8J$	○	○	○	○
5.	Electric field at a distance of $20cm$ from a $4\mu c$ charge is:	$3\times10^{3}N/C$	$9\times10^{5}N/C$	$4.5\times10^{5}N/C$	$3\times10^{5}N/C$	○	○	○	○
6.	The unit of product of resistance and capacitance is equal to unit of:	Time	Potential difference	Current	Work	○	○	○	○
7.	Kirchhoff's voltage rule is a way of stating conservation of:	Momentum	Charge	Angular momentum	Energy	○	○	○	○
8.	Two long straight wires have current flowing in them in the opposite direction, the force between the wires is:	Repulsive	Zero	Undefined	Attractive	○	○	○	○
9.	Galvanometer can be made more sensitive if $\frac{C}{BAN}$ is made:	Infinite	Zero	Smaller	Larger	○	○	○	○
10.	Which of the following quantities **DO NOT** change in a step-up transformer?	Voltage	Power	Heat	Current	○	○	○	○
11.	When the current in a coil changes from '0' to $5A$ in $0.025S$, an average E.M.F induced in a neighboring coil is $600V$, the mutual inductance for two coils is:	12.5 henry	6 henry	7.5 henry	3 henry	○	○	○	○
12.	The phase difference between the current and voltage at resonance is:	π	$-\pi$	$\pi/2$	0	○	○	○	○
13.	If the peak value of alternating current is $7\sqrt{2}A$, then the mean square value of current will be?	$25A$	$7\sqrt{2}A$	$49A$	$7A$	○	○	○	○
14.	_____ is **NOT** a ferromagnetic material.	Nickel	Cobalt	Wood	Iron	○	○	○	○
15.	If a wire is stretched to four times of its length. The strain is:	3	1	0.5	4	○	○	○	○
16.	If in a transistor both collector-base and base-emitter junctions are reversed biased then it is:	Cut-off region	Saturation region	Q-point	Active region	○	○	○	○
17.	By reducing the absolute temperature of a black body to half, the total energy radiated will change by a factor:	4	16	$\frac{1}{16}$	$\frac{1}{4}$	○	○	○	○

- $W=\frac{1}{2}CV^2$
- $\varepsilon=-\frac{\Delta}{\Delta t}(MI)$
- $\varepsilon=\frac{\Delta L}{L}$
- $\lambda=\frac{h}{mv}$
- $I_{rms}=0.7071I_m$
- $E_n=-\frac{E_o}{n^2}$
- $RC=t$
- $\sigma=5.67\times10^{-8}Wm^{-2}K^{-4}$
- $E_o=2.17\times10^{-18}J$
- $E=\sigma T^4$
- $E=\frac{q}{4\pi\varepsilon_o r^2}$

IIII

PHYSICS HSSC–II

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

NOTE: Answer any fourteen parts from Section 'B' and any two questions from Section 'C'. Write your answers neatly and legibly.

SECTION – B (Marks 42)

Q. 2 Attempt any FOURTEEN parts. All parts carry equal marks. **(14 x 3 = 42)**

(i) Briefly explain the concept of electric dipole.

(ii) Describe the factors affecting the force on a current carrying conductor in a magnetic field.

(iii) When Wheatstone bridge is balanced, then no current flows through galvanometer. Explain briefly.

(iv) Why rise in temperature of a conductor is accompanied by rise in the resistance?

(v) How is Lenz's law a consequence of law of conservation of energy?

(vi) Briefly explain the production of back EMF in electric motor.

(vii) Two long parallel wires $8\,cm$ apart carry currents of $6A$ and $2A$ in the same direction. What is the magnitude of magnetic field mid-way between them?

(viii) How is a $10mA,\ 50\Omega$ galvanometer converted into $20V$ voltmeter?

(ix) A pure inductor is connected across a $5V, 100\,Hz$ supply, and current flowing through it is measured as $0.2\,A$ Determine the value of its inductance.

(x) Describe impedance as vector sum of resistances and reactances.

(xi) Distinguish between brittle and ductile substances.

(xii) Briefly explain any use of super conductors.

(xiii) Can a P-N Junction be also called potential barrier? Explain briefly.

(xiv) Determine the wave length of electron that has been accecrated through a potential difference of $100V$.

(xv) Describe uncertainty principle.

(xvi) Briefly explain working of transistor as switch.

(xvii) Describe the origion of different types of optical spectra.

(xviii) Write down postulates of Bohr's model of hydrogen atom.

(xix) Which of the 'Fission reaction' and 'Fusion reaction' is difficult to achieve? Give reason.

(xx) The half life of Polonium-214 is 0.1643 seconds. Determine the decay constant (λ).

SECTION – C (Marks 26)

Note: Attempt any TWO questions. All questions carry equal marks. **(2 x 13 = 26)**

Q. 3 a. State Gauss's law. Also find electric field intensity due to an infinite sheet of charge.

b. A heating coil has a resistance of 10Ω. It is designed to operate on $220V$. What energy in Joules is supplied to the heater in $5S$?

Q. 4 a. Discuss, the principle, construction and working of A.C generator. Also derive an expression for induced E.M.F and induced current.

b. A coil having resistance of 10Ω and inductance of $30\,mH$ is connected to $230V, 50Hz$ supply. Calculate

(i) Circuit current **(ii)** Phase angle **(iii)** Power consumed

Q. 5 a. What is LASER? Explain the principle and operation of LASER.

b. Helium He_2^4 has an atomic mass of $4.002603u$. Find:

(i) Mass defect **(ii)** Binding energy

(iii) Binding energy per nucleon for this nucleus.

Important formulae

- $B = \frac{u_o I}{2\pi r}$
- $R_s = \frac{I_g R_g}{(I - I_g)}$
- $L = \frac{X_L}{2\pi f}$
- $K.E = q\Delta V$
- $\lambda = \frac{h}{mv}$
- $M_{electron} = 9.1\times10^{-31}\,kg$
- $\lambda = \frac{0.693}{T_{1/2}}$
- $M_{neutron} = 1.008665u$
- $M_{proton} = 1.007825u$
- $W = I^2Rt$
- $M_{proton} = 1.67\times10^{-27}\,kg$
- $E = \Delta mc^2$
- $F = ILB\sin\theta$
- $\lambda = \frac{h}{\sqrt{2m_e q_e \Delta V}}$
- Binding energy per nucleon $= \frac{E_b}{h}$

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ROLL NUMBER					

Answer Sheet No. _____

Sign. of Candidate _____

Sign. of Invigilator _____

Section – A is compulsory. All parts of this section are to be answered on this page and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. Do not use lead pencil.

PHYSICS HSSC–II

SECTION – A (Marks 17)

Time allowed: 25 Minutes

حصہ اوّل لازمی ہے۔ اس کے جوابات اسی صفحہ پر دیے گئے کرنا ظم مرکز کے حوالے کریں۔ کاٹ کر دوبارہ لکھنے کی اجازت نہیں ہے۔ لیڈ پنسل کا استعمال ممنوع ہے۔

Fill the relevant bubble against each question:

ہر سوال کے سامنے دیے گئے درست دائرہ کو پر کریں۔

1.	Work done in moving a charge of $6C$ between two points is $10J$. What is the potential difference between two points?	◯ $60V$	◯ $6V$	◯ $0.6V$	◯ $1.66V$
2.	Four charges $+Q,-Q,+Q,-Q$ are placed at the corners of a square taken in order. At the centre of the square.	◯ $E=0, V=0$	◯ $E=0, V\neq 0$	◯ $E\neq 0, V=0$	◯ $E\neq 0, V\neq 0$
3.	A wire of resistance 'R' is stretched till its radius is half of the original value. The resistance of stretched wire is:	◯ 2R	◯ 4R	◯ 8R	◯ 16R
4.	Energy consumed by a 60-watt bulb in 2 minutes is:	◯ 7.2 kJ	◯ 720 J	◯ 120 J	◯ 72000 J
5.	The unit of magnetic flux is:	◯ $Wb.m^{-2}$	◯ $Wb.m^{2}$	◯ Wb	◯ Tesla
6.	The working principle of galvanometer is based upon:	◯ Momentum	◯ Torque	◯ Force	◯ Impulse
7.	If the motor is overloaded then the magnitude of back e.m.f:	◯ Increases	◯ Decreases	◯ Becomes zero	◯ Remains constant
8.	The current in a coil of inductance 5H decreases at the rate of $2A/s$. The induced e.m.f is:	◯ 2.5V	◯ 0.4V	◯ 10V	◯ –10V
9.	The phase difference between the current and voltage at resonance in R.L.C series A.C circuit is:	◯ 0	◯ $-\frac{\pi}{2}$	◯ $-\pi$	◯ $\frac{\pi}{2}$
10.	A body which breaks down just after crossing the elastic limit is known as:	◯ Elastic	◯ Hard	◯ Ductile	◯ Brittle
11.	Which factor does not affect the conductivity of a PN junction diode?	◯ Doping	◯ Temperature	◯ Voltage	◯ Pressure

12.	Photon A has twice the energy of photon B. What is the ratio of the momentum of A to that of B?	◯ 4:1	◯ 2:1	◯ 1:1	◯ 1:2
13.	Pair production occurs only when energy of photon is at least equal to:	◯ 1.02 KeV	◯ 1.02 eV	◯ 1.02 MeV	◯ 1.02 GeV
14.	Which of the following series of hydrogen spectra lies in the ultraviolet region of the spectrum?	◯ Lyman series	◯ Balmer series	◯ Paschen series	◯ Pfund series
15.	If an electron jumps from second orbit to first orbit in hydrogen atom, it emits photon of:	◯ 3.40 eV	◯ 10.20 eV	◯ 13.6 eV	◯ 3.8 eV
16.	The quantity of uranium is 400g, the amount of uranium left after three half-lives is:	◯ 12.5 g	◯ 25g	◯ 50 g	◯ 100 g
17.	The particles that experience strong nuclear force are:	◯ Photons	◯ Leptons	◯ Bosons	◯ Hadrons

Important formulae

- $\phi = \frac{Q}{\varepsilon_o}$
- $q_o \Delta V = W_{BA}$
- $P = \frac{W}{t} = \frac{E}{t}$
- $R = \rho \frac{L}{A}$
- $\varepsilon = L \frac{\Delta I}{\Delta t}$
- $p = \frac{E}{c}$
- $E = E_n - E_p$
- $E_n = -\frac{E_o}{n^2}$
- $E_o = 13.6eV$
- $h = 6.63 \times 10^{-34} J.s$

ROLL NUMBER					

PHYSICS HSSC–II

20

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

NOTE: Answer any fourteen parts from Section 'B' and any two questions from Section 'C'. Use supplementary answer sheet i.e. Sheet–B if required. Write your answers neatly and legibly. Statistical table will be provided on demand.

SECTION – B (Marks 42)

Q. 2 Attempt any FOURTEEN parts. All parts carry equal marks. **(14 x 3 = 42)**

(i) Why is it safe to stay inside an automobile during a light storm?

(ii) Two charges $5\times10^{-8}C$ and $-3\times10^{-8}C$ are located $16cm$ apart. At what point on the line joining the two charges is electric potential zero? Take the Potential at infinity to be zero.

(iii) Describe a circuit which will give a continuously varying potential.

(iv) State and prove maximum power transfer theorem.

(v) Will the two long, straight parallel wires carrying current in opposite direction attract or repel each other? Explain briefly.

(vi) What is galvanometer? How a $5mA, 100\Omega$ galvanometer is converted into 20V voltmeter?

(vii) Can an efficient step up transformer increase the power level?

(viii) State and prove the second postulate of Bohr Model of Hydrogen atom.

(ix) Prove that an ideal capacitor connected to an A.C source does not dissipate power.

(x) In a R.L series A.C circuit, will the current lag or lead the voltage? Illustrate your answer by a phasor diagram.

(xi) Differentiate between paramagnetic, diamagnetic and ferromagnetic materials with suitable examples.

(xii) Draw and explain the stress-strain curve for a ductile material.

(xiii) What is the working principle of magnetic levitation train? Explain how can it acquire high speed?

(xiv) Why is transistor called current amplification device?

(xv) Explain how a PN junction diode acts as a half wave rectifier?

(xvi) Deduce the relation between α and β of a transistor.

(xvii) The life time of electron in the excited state is about $10^{-8}s$. What is the uncertainty in energy during this time?

(xviii) What is the wavelength of the second line of Paschen Series?

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

(xx) Find the energy released when $\beta-$decay changes $^{234}_{90}Th$ into $^{234}_{91}Pa$. Given that

Mass of $^{234}_{90}Th = 234.0436u$, Mass of $^{234}_{90}Pa = 234.0428u$ and Mass of $^{0}_{-1}\beta = 0.00055u$

SECTION – C (Marks 26)

Note: Attempt any TWO questions. All questions carry equal marks. **(2 x 13 = 26)**

Q. 3 a. Describe the process of charging and discharging of a capacitor by sketching the graphs for the growth and decay of charge on the capacitor. **(05)**

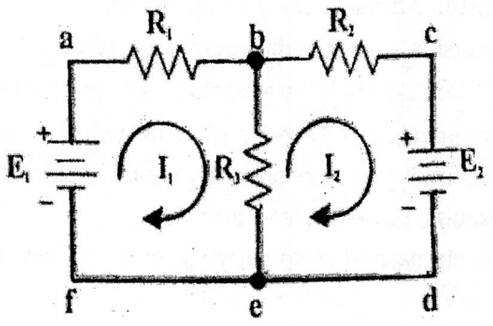
b. State Ampere's Law. Derive an expression for the magnetic field due to a current carrying solenoid. **(04)**

c. A long solenoid with 15 turns per cm has a small loop of area $2.0cm^2$ placed inside the solenoid normal to its axis. If the current carried by the solenoid changes steadily from 2.0A to 4.0A in 0.1s, What is the induced e.m.f in the loop while the current is changing? **(04)**

Q. 4 **a.** State the term impedance for an A.C circuit. Derive an expression for the impedance of R.L.C series A.C circuit. State the condition of resonance. **(05)**

b. What are X-rays? Discuss how inner shell transitions in heavy elements result into emission of characteristic X-rays. **(04)**

c. Determine the current in each loop of the given circuit. Given that, $R_1 = 1\Omega$, $R_2 = 2\Omega$, $R_3 = 3\Omega$, $E_1 = 5V$ and $E_2 = 10V$. **(04)**



Q. 5 **a.** State photoelectric effect. Discuss experimental results and photon theory of photoelectric effect. **(07)**

b. What is meant by nuclear fusion? Discuss how can energy be released in the fusion process? Illustrate with an example of proton-cycle. **(06)**

Important formulae

- $E = \frac{kq}{r^2}$
- $\phi = \vec{E}.\vec{A}$
- $\phi = \frac{Q}{\varepsilon_o}$
- $P = VI = I^2R$
- $V = IR$
- $\Sigma V = 0 \Rightarrow \Sigma IR = 0$
- $P = < VI >$
- $V = k\frac{q}{r}$
- $R_h = \frac{V}{I} - R_g$
- $\varepsilon = N\frac{\Delta\phi}{\Delta t}$
- $\varepsilon = L\frac{\Delta I}{\Delta t}$
- $\phi = NBA$
- $I_E = I_B + I_C$
- $V_S I_S = V_P I_P$
- $I = I_m \cos\omega t$
- $V = V_m \sin\omega t$
- $K.E_{max} = V_o e$
- $Z = \sqrt{R^2 + (X_L - X_C)^2}$
- $Elastic\ Modulus = \frac{Stress}{Strain}$
- $\frac{1}{\lambda} = R_h\left(\frac{1}{P^2} - \frac{1}{n^2}\right)$
- $(\Delta E)(\Delta t) = h$
- $\alpha = \frac{I_C}{I_E}$, $\beta = \frac{I_C}{I_B}$
- $L = mvr$
- $e = 1.602 \times 10^{-19} C$
- $k = 9 \times 10^9 Nm^2C^{-2}$
- $\mu_o = 4\pi \times 10^{-7} WbA^{-1}m^{-1}$
- $R_h = 1.0973732 \times 10^7 m^{-1}$
- $h = 6.63 \times 10^{-34} J.s$
- ${}^{A}_{Z}X \rightarrow {}^{A}_{Z+1}X + {}^{0}_{-1}\beta + Q$

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ROLL NUMBER					

Answer Sheet No._____

Sign. of Candidate _____

Sign. of Invigilator _____

Section – A is compulsory. All parts of this section are to be answered on this page and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. Do not use lead pencil.

PHYSICS HSSC–II

SECTION – A (Marks 17)

Time allowed: 25 Minutes

حصہ اوّل لازمی ہے۔ اس کے جوابات اسی صفحہ پر دیے گئے نظم مرکز کے حوالے کریں۔ کاٹ کر دوبارہ لکھنے کی اجازت نہیں ہے۔ لیڈ پنسل کا استعمال ممنوع ہے۔

Fill the relevant bubble against each question:

ہر سوال کے سامنے دیے گئے درست دائرہ کو پُر کریں۔

1.	A point charge $+q$ is placed at the centre of a cube of side 'a'. The electric flux emerging from the cube is:	○ *Zero*	○ $\frac{q}{\varepsilon_o}$	○ $\frac{q}{6\varepsilon_o}$	○ $\frac{q}{\varepsilon_o a^2}$
2.	The energy of an electron which accelerates through a potential difference of 1000 V is:	○ $1.6\times10^{-22}J$	○ $1.6\times10^{-20}J$	○ $1.6\times10^{-19}J$	○ $1.6\times10^{-16}J$
3.	A wire of uniform cross-sectional area 'A' and length 'L' is cut into two equal parts. The resistance of each part becomes.	○ Double	○ Half	○ Four time	○ Eight time
4.	The maximum output power is delivered to a load resistance 'R', when the internal resistance 'r' of the source is equal to:	○ ∞	○ 0	○ R	○ $\frac{R}{2}$
5.	The unit of magnetic flux density is:	○ $Wb.m^2$	○ $Wb.m^{-2}$	○ NAm^{-1}	○ NmA^{-1}
6.	Work done on a charged particle moving in a uniform magnetic field is:	○ Minimum	○ Maximum	○ Zero	○ Negative
7.	When carrying electricity on long distances, step-up transformers are used to:	○ Increase voltage, reduce current	○ Increase current, reduce voltage	○ Increase both voltage and current	○ Increase both voltage and power
8.	The capacitive reactance in a pure capacitive D.C circuit is:	○ Very small	○ Very large	○ Zero	○ Infinite
9.	An electromagnetic wave is generated by:	○ Any moving charge	○ Any accelerating charge	○ A charge with changing acceleration	○ A charge moving in a circle
10.	If both the length and radius of the rod are doubled, then modulus of elasticity will:	○ Increase	○ Decrease	○ Remains the same	○ Be doubled

11. The knee voltage for Germanium is:	◯ 0.3V	◯ 0.5V	◯ 0.7V	◯ 1.1V
12. In transistor, the emitter current, I_E is $3.5A$ and collector current, I_C is $2.35A$. What will be the base current?	◯ 5.85A	◯ 1.15A	◯ 1.48A	◯ 0.67A
13. Which particle has the shortest wavelength, if all are having the same velocity?	◯ Electron	◯ Proton	◯ Neutron	◯ $\alpha-$ particle
14. If an object moves with speed of light, its mass will be:	◯ Zero	◯ Maximum	◯ Infinity	◯ Minimum
15. The energy of the electron in the excited state $n=3$ in hydrogen atom is:	◯ –13.6eV	◯ –1.15eV	◯ –3.40eV	◯ –0.54eV
16. The process of generating three dimensional image of the object using laser beam is called:	◯ Holography	◯ Tomography	◯ Scanning	◯ 3-D Cinema
17. Mass equivalent of 931 MeV energy is:	◯ $1.66\times10^{-27}kg$	◯ $6.02\times10^{-27}Kg$	◯ $6.02\times10^{-23}Kg$	◯ $2.67\times10^{-27}kg$

Important formulae

- $I=\dfrac{\varepsilon}{R+r}$
- $\phi=\vec{E}.\vec{A}$
- $X_C=\dfrac{2}{2\pi fC}=\dfrac{1}{\omega C}$
- $R=\rho\dfrac{L}{A}$
- $I_E=I_B+I_C$
- $V=IR$
- $Elastic\ Modulus=\dfrac{Stress}{Strain}$
- $\lambda=\dfrac{h}{mv}$
- $E_n=-\dfrac{E_o}{n^2}$
- $e=1.602\times10^{-19}C$
- $1eV=1.602\times10^{-19}J$
- $E_o=13.6eV$
- $P=VI\cos\phi$
- $\Delta(KE)=q\Delta V$

ROLL NUMBER					

PHYSICS HSSC–II

22

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

NOTE: **Answer any fourteen parts from Section 'B' and any two questions from Section 'C'. Use supplementary answer sheet i.e. Sheet–B if required. Write your answers neatly and legibly. Statistical table will be provided on demand.**

SECTION – B (Marks 42)

Q. 2 Attempt any FOURTEEN parts. All parts carry equal marks. **(14 x 3 = 42)**

(i) Explain why the capacitance of a parallel plate capacitor increases when a dielectric slab is placed between its plates?

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

(iii) Why the e.m.f of a cell is always greater than its terminal voltage?

(iv) What is Wheatstone bridge? Deduce the condition for which Wheatstone bridge is balanced?

(v) How can one sperate particles of different velocities moving in a magnetic field?

(vi) A copper wire of diameter 1.6 mm carries a current of 20A. Find maximum magnitude of magnetic field due to this current.

(vii) How are eddy current produced in an iron core of transformer and how can they be minimized?

(viii) An induced e.m.f has no direction of its own. Explain breifly.

(ix) When an A.C source is connected to an ideal inductor, show that the average power supplied by the source over a complete cycle is zero.

(x) What is the basic principle of generation of electromagnetic waves?

(xi) Briefly explain the working principle of magnetic levitation train.

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

(xiii) How a PN-Junction diode is used as a full-wave rectifier?

(xiv) What is a transistor? Discuss the operation of NPN transistor.

(xv) What is meant by wave-particle duality? Explain on the basis of de-Broglie hypothesis.

(xvi) Calculate the shortest and longest wavelength of radiation for the Brackett Series.

(xvii) How can the spectrum of hydrogen contain so many lines even though a hydrogen atom has only a single electron?

(xviii) Describe the construction and working of Helium-Neon Laser.

(xix) The mass of $^{14}_{7}N$ nucleus is $13.999234u$. Calculate its binding energy. Given that Mass of Proton $= 1.007276u$ and Mass of Neutron $= 1.008665u$.

(xx) How can energy be released in the nuclear fusion process?

SECTION – C (Marks 26)

Note: Attempt any TWO questions. All questions carry equal marks. **(2 x 13 = 26)**

Q. 3 **a.** State the principle of A.C generator. Explain by sketching graph, how is an A.C generator used to produce an alternating current? (05)

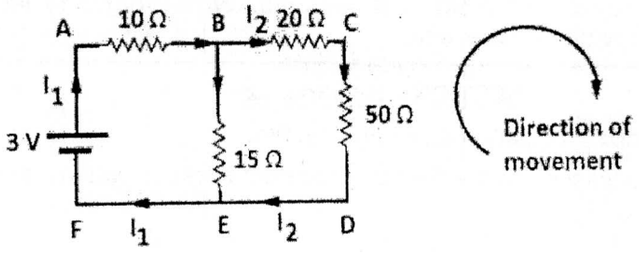
b. A current carrying loop is placed in a magnetic field. Derive an expression for the torque acting on it. (04)

c. Describe hysteresis loop for a magnetic material by drawing its curve for iron. (04)

Q. 4 **a.** Derive a relation for an impedance and resonant frequency in R.L.C series A.C circuit. **(05)**

b. State Gauss's law for electrostatics. Using Gauss's Law, derive a relation for the electric field intensity at a point due to a uniformly charged infinite plane sheet. **(04)**

c. Calculate the current in each branch of the circuit using Kirchoff's voltage law. **(04)**



Q. 5 **a.** What is a nuclear reactor? Give the principle, construction and working of a typical nuclear reactor. **(07)**

b. State the postulates of special theory of relativity. Discuss time dilation and length contraction as a consequence of special theory of relativity. **(06)**

Important formulae

- $E = \frac{kq}{r^2}$
- $\phi = \vec{E}.\vec{A}$
- $\Sigma V = 0 \rightarrow \Sigma IR = 0$
- $\varepsilon = N\frac{\Delta\phi}{\Delta t}$
- $P = VI$
- $V = IR$
- $V = V_m \cos\omega t$
- $Z = \sqrt{R^2 + (X_L - X_C)^2}$
- $P = VI\cos\phi$
- $I_E = I_B + I_C$
- $\lambda = \frac{h}{P} = \frac{h}{mv}$
- $\frac{1}{\lambda} = R_h\left(\frac{1}{P^2} - \frac{1}{n^2}\right)$
- $B.E(in\,MeV) = 931 \times \Delta m$
- $\Delta m = Zm_p + (A - Z)m_n - M_{(A,Z)}$
- $m_e = 9.109 \times 10^{-31} kg$ $= 5.485 \times 10^{-4} \mu$
- $k = 9 \times 10^9 Nm^2C^{-2}$
- $\mu_o = 4\pi \times 10^{-7} WbA^{-1}m^{-1}$
- $R_h = 1.0973732 \times 10^7 m^{-1}$
- $c = 3 \times 10^8 m/s$
- $m_p = 1.673 \times 10^{-27} kg$ $= 1.007u = 937MeV$
- $m_n = 1.675 \times 10^{-27} kg$ $= 1.008u = 938MeV$
- $e = 1.602 \times 10^{-19} C$
- $C_{med} = \frac{\varepsilon_o \varepsilon_r A}{d}$
- $E = \frac{V}{d} = \frac{Q}{\varepsilon_o A}$
- $F_m = qvB$
- $F_e = qE$
- $\varepsilon = IR + Ir$
- $B = \frac{\mu_o I}{2\pi r}$
- $F = NBIL$
- $\tau = Fl$
- $\sigma = \frac{Q}{A}$