Version No.			
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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

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

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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)**

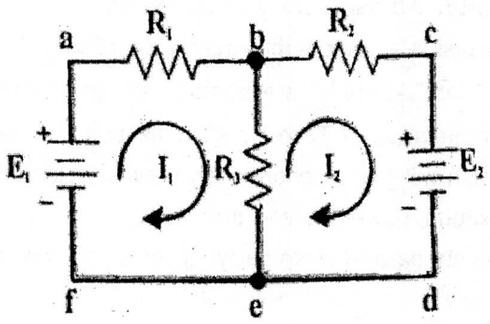
b. State Ampere's Law. Derive an expression for the magnetic field due to a current carrying solenoid. **(04)**

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

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