



Roll No. _____ to be filled in by the candidate.

(NEW PATTERN)

Paper Code	8	4	7	1
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Physics (Objective Type)**Sessions; 2012-2014 & 2013-2015****Time: 20 Minutes****Marks: 17**

NOTE: Write answers to the questions on objective answer sheet provided. Four possible answers A, B, C & D to each question are given. Which answer you consider correct, fill the corresponding circle A, B, C or D given in front of each question with Marker or pen ink on the answer sheet provided.

- The electrostatic force of repulsion between two electrons at a distance 1m is:
 (A) $2.3 \times 10^{-24} \text{ N}$ (B) $2.3 \times 10^{-26} \text{ N}$ (C) $2.3 \times 10^{-28} \text{ N}$ (D) $2.3 \times 10^{-30} \text{ N}$
- A charged conductor has charge on its.
 (A) Inner-surface (B) outer-surface (C) middle point (D) surrounding space
- Ampere second stands for the unit of:
 (A) charge (B) emf (C) energy (D) power
- The relation between current I and angle of deflection θ in a moving coil galvanometer is:
 (A) $I \propto \theta$ (B) $I \propto \frac{1}{\theta}$ (C) $I \propto \sin \theta$ (D) $I \propto \cos \theta$
- Lorentz force is given by:
 (A) $q(\vec{E} - \vec{V} \times \vec{B})$ (B) $q(\vec{E} + \vec{V} \times \vec{B})$ (C) $q[\vec{E} \times (\vec{V} + \vec{B})]$ (D) $q(\vec{V} + \vec{E} \times \vec{B})$
- Which one of the following is not present in an A.C generator.
 (A) Armature (B) Commutator (C) Magnet (D) Slip ring
- The core of transformer is laminated to reduce.
 (A) Magnetic loss (B) Hysteresis loss (C) Eddy current loss (D) electric loss
- In RLC parallel circuit the resonance frequency is:
 (A) $2\pi\sqrt{LC}$ (B) $\frac{1}{2\pi}\sqrt{LC}$ (C) $\frac{2\pi}{\sqrt{LC}}$ (D) $\frac{1}{2\pi\sqrt{LC}}$
- Electromagnetic waves emitted from radio antenna are:
 (A) Stationary (B) Longitudinal (C) Transverse (D) both A & B
- Minority carriers in p-type substances are:
 (A) Holes (B) Electrons (C) Protons (D) Positrons
- 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) $-\frac{R_1}{R_2}$
- The common emitter current amplification factor β is given by:
 (A) $\frac{I_B}{I_E}$ (B) $\frac{I_E}{I_B}$ (C) $\frac{I_C}{I_E}$ (D) $\frac{I_C}{I_B}$
- In Compton effect the photon behaves as a:
 (A) wave (B) particle (C) nucleon (D) both A & C
- The binding energy per nucleon is maximum for:
 (A) Helium (B) Iron (C) Polonium (D) Radium
- Gamma rays from cobalt-60 are used for the treatment of:
 (A) Circulation of blood (B) Cancer (C) Heart attack (D) Thyroid glands
- The radius of 10th orbit in hydrogen atom is:
 (A) 0.053nm (B) 0.53nm (C) 5.3nm (D) 53nm
- In an electronic transition atom can not emit:
 (A) Infrared radiations (B) Ultraviolet radiations (C) visible radiations (D) γ -radiations

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

(NEW PATTERN)

Subject Code

6

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4

7

Physics (Essay Type)

Sessions; 2012-2014 & 2013-2015

Time: 3:10 Hours

Marks: 83

Section - I**2- Write short answers of any eight parts from the following.****2 x 8 = 16**

- i. Show that ϵ and $\frac{\Delta\phi}{\Delta t}$ have same units.
- ii. Electric lines of force never cross each other. Why?
- iii. A sensitive galvanometer cannot be stable. Explain?
- iv. Describe five properties electric lines of forces.
- v. Can a step up transformer increase the power level?
- vi. Why is "B" non-zero outside a solenoid?
- vii. What is time constant of a capacitor resistance circuit and prove that. $R.C =$ time constant.
- viii. Why does the picture on a TV screen become distorted when a magnet is brought near screen?
- ix. A plane conducting loop is located in a uniform magnetic field that is directed along x-axis. For what orientation of loop is flux, a maximum. For what orientation is flux, a minimum?
- x. How can you identify that which plate of a capacitor is positively charged?
- xi. How would you position a flat loop of wire in a changing magnetic field so that there is no emf induced in the loop?
- xii. What are similarities between a Motor and a Generator.

3- Write short answers of any eight parts from the following.**2 x 8 = 16**

- i. What is choke?
- ii. Write four applications of photodiode.
- iii. Distinguish between crystalline and amorphous solids.
- iv. Write four properties of parallel resonance circuit.
- v. What is meant by strain energy?
- vi. Write a brief note on super conductor.
- vii. Why is the base current in a transistor very small?
- viii. Do bend in a wire affect its electrical resistance? Explain.
- ix. What are the difficulties in testing whether the filament of the lighted bulb obeys Ohm's law?
- x. How does doubling the frequency affect the reactance of (a). an inductor. (b). a capacitor?
- xi. Why we prefer potentiometer in place of voltmeter for measuring potential difference?
- xii. What is the effect of forward and reverse biased of a diode on the width of depletion region?

4- Write short answers of any six parts from the following.**2 x 6 = 12**

- i. The rest mass of photon is zero. What can you say about its momentum? Explain briefly.
- ii. What advantages an electron microscope has over the optical microscope?
- iii. What do you understand by background radiation? State two sources of this radiation.
- iv. Protons and neutrons are formed by what type of quarks? Show by diagram.
- v. Can an electron in the ground state of hydrogen atom absorb a photon of energy 13.6 eV or greater than 13.6 eV?
- vi. Find mass "m" of an object moving with speed of 0.8c.
- vii. Define excitation energy and ionization energy.
- viii. Describe operational principle of solid state detector.
- ix. Define "mass defect" and "binding energy".

Section - II

NOTE: Answer any three questions from the following.

8x3=24

5. (a) What is electric potential? Find electric potential at a point due to a point charge. 05
(b) A rectangular bar of iron is 2.0 cm by 2.0 cm in cross section and 40cm long. Calculate its resistance if the resistivity of iron is $11 \times 10^{-8} \Omega m$. 03
6. (a) Describe the principle, construction and working of a galvanometer, hence show that the deflection is directly proportional to current. 05
(b) A D.C motor operates at 240V and has a resistance of 0.5Ω when the motor is running at normal speed the armature current is 15A. Find the back emf in the armature. 03
7. (a) Describe R.L.C series circuit. Derive the relation for resonance frequency in this circuit. Also give its properties. 05
(b) What stress would cause a wire to increase in length by 0.01% if the Young's Modulus of the wire is 1.2×10^{10} Pa. What force would produce this stress if diameter of wire is 0.56mm? 03
8. (a) State two postulates of special theory of relativity. Give its three consequences. 05
(b) In a certain circuit, the transistor has a collector current of 10mA and a base current of $40 \mu A$. What is the current gain of transistor? 03
9. (a) Derive the expression for radius of orbit and velocity of electron in an orbit on the basis of Bohr's atomic model. 05
(b) A 75kg person receives a whole body radiation dose of 24 mrad delivered by x-particles for which RBF factor is 12 calculate: (a). the absorbed energy in joules (b). the equivalent dose in rem. 03

Section -III (Practical)

10.A Answer any four parts from the following.

2x4=08

- (i). Draw circuit diagram of slide wire bridge experiment.
(ii). Write down the symbol and Truth table of NAND gate.
(iii). In half deflection method when both keys are closed and shunt resistance is zero. What deflection is shown by the galvanometer? And why ?
(iv). Why the period of flashes increases in Neon flash lamp experiment with the increase in resistance?
(v). When capacitors are connected in parallel whether their capacitance is increased or decreased? Explain.
(vi). How would you convert galvanometer into a voltmeter?
(vii). In photoelectric effect, by decreasing the distance between light bulb and photocell, current increases. Why?
(viii). Why we connect the voltmeter parallel to measure the potential difference across two points in a circuit?
- B. Write down procedure to determine the resistance of a galvanometer by half deflection method. 03

OR

Write down the procedure to prove that photoelectric current is proportional to the intensity of light.

C. Answer the following questions on the basis of graph drawn below. 04

Graph is plotted between R-S and RxS on the back page at No. A.

- (i). Find the slope of graph. (ii). Which quantity is represented by the slope of graph? give its unit.

OR

Graph is plotted between resistance and time period of flashes of Neon Flash lamp on the back page at No. B.

- (i). What you conclude from the graph? (ii). Find time period for resistance $3.5 K \Omega$.



Roll No. _____ to be filled in by the candidate.

(OLD PATTERN)

Paper Code	4	4	7	1
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Physics (Objective Type)

Session;2011-2013

Time: 20 Minutes

Marks: 17

NOTE: Write answers to the questions on objective answer sheet provided. Four possible answers A,B,C & D to each question are given. Which answer you consider correct, fill the corresponding circle A,B,C or D given in front of each question with Marker or pen ink on the answer sheet provided.

1.1. Electron-volt is the unit of:

- (A) Potential difference (B) Electric energy (C) Electric current (D) Capacitance

2. Coulomb's electrostatic force is:

- (A) Non conservative force (B) Conservative force (C) Gravitational force (D) Mechanical force

3. In case of colour code for carbon resistance, tolerance for silver band is:

- (A) $\pm 5\%$ (B) $\pm 6\%$ (C) $\pm 10\%$ (D) $\pm 20\%$

4. The galvanometer can be made sensitive by making the factor $\frac{C}{BAN}$:

- (A) large (B) small (C) constant (D) intermediate

5. The S.I unit of magnetic flux is:

- (A) NmA^{-1} (B) NA m^{-1} (C) NmA^{-2} (D) Nm^2A^{-1}

6. Lenz's law is in accordance with the law of conservation of:

- (A) Momentum (B) Charge (C) Energy (D) Mass

7. If back emf in a motor decreases, then it will draw:

- (A) Zero current (B) More current (C) Steady current (D) Small current

8. The total reactance of RLC- series circuit at resonance is:

- (A) Equal to resistance (B) Infinity (C) Zero (D) One

9. Electromagnetic waves transport:

- (A) Current (B) Wavelength. (C) Energy (D) Voltage

10. The S.I unit of stress is:

- (A) Nm (B) NA^{-1} (C) Nm^{-1} (D) Nm^{-2}

11. In reverse biasing, p-n junction offers:

- (A) Low resistance (B) High resistance (C) Zero resistance (D) Infinite resistance

12. The value of potential barrier for silicon diode is:

- (A) 0.7 volt (B) 0.3 volt (C) 0.5 volt (D) 0.6 volt

13. If a material object moves with speed of light, its mass becomes:

- (A) Equal to rest mass (B) Four times of rest mass (C) Zero (D) Infinite

14. Davisson-Germer confirmed the:

- (A) Particle nature of light (B) Wave nature of particles
(C) Dual nature of light (D) Electromagnetic nature of light

15. The diameter of an atom is of the order of:

- (A) 10^{-12}m (B) 10^{-14}m (C) 10^{-10}m (D) 10^{-8}m

16. The amount of energy equivalent to 1 a.m.u is:

- (A) 9.315MeV (B) 93.15MeV (C) 931.5MeV (D) 2.224MeV

17. Natural radioactivity was discovered by:

- (A) H.Becquerel (B) J.J Thomson (C) Rutherford (D) Madame curies

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

(OLD PATTERN)

Subject Code 4 4 7

Physics (Essay Type)

Session;2011-2013

Time: 2:40 Hours

Marks: 68

Section - I**2- Write short answers of any eight parts from the following.****2 x 8 =16**

- Describe the force or forces on positive point charge when placed between parallel plates with similar and equal charges.
- Can a D.C motor be turned into D.C generator? What changes are required to be done?
- Is it possible to orient a current loop in uniform magnetic field such that loop will not tend to rotate? Explain.
- How can you use a magnetic field to separate isotopes of chemical element?
- Define Faraday's law of electromagnetic induction.
- What is self induction?
- Define current sensitivity of galvanometer.
- What is restoring torque?
- Define dielectric constant.
- What is meant by electric polarization of dielectrics?
- Show that ϵ and $\frac{\Delta\phi}{\Delta t}$ have same units.
- Explain that electric lines of force never cross?

3- Write short answers of any eight parts from the following.**2 x 8 =16**

- What is conventional current?
- Write uses of superconductors.
- Write three characteristics of series resonance circuit.
- What is net charge on n-type and P-type substances?
- What are the difficulties in testing whether the filament of lighted bulb obeys Ohm's law?
- Explain the conditions under which electromagnetic waves are produced from source.
- Write the formulas for series and parallel combinations of resistors.
- Define modulus of elasticity. Show that units of modulus of elasticity and stress are same.
- What is meant by paramagnetic and ferromagnetic substances?
- How does doubling the frequency affect the reactance of: (a).Capacitor. (b).Inductor?
- Why a Photodiode is operated in reverse biased state?
- Draw the symbolic diagram of NOT gate and write its truth table.

4- Write short answers of any six parts from the following.**2 x 6 =12**

- What is nuclear fission? Write down its equation.
- Is it possible to create a single electron from energy? Explain.
- Prove that $1U=931.5\text{MeV}$.
- Can pair production take place in Vacuum? Explain.
- State uncertainty principle.
- What do we mean when we say that the atom is excited?
- A particle which produces more ionization is less penetrating. Why?
- Write down any two postulates of Bohr's theory of hydrogen atom.
- Is energy conserved when an atom emits a photon of light? Explain.

Section - II**NOTE: Answer any three questions from the following.****8x3=24**

- (a) Define electric flux. When flux is maximum and minimum? Calculate flux through a closed spherical surface having a charge +q at its centre. **5**
(b) A current of 0.75A flows through an iron wire when a battery of 1.5V is connected across its ends. The length of wire is 5.0m and its cross sectional area is $2.5 \times 10^{-7} \text{m}^2$. Compute the resistivity of iron. **3**
- (a) Define and explain Faraday's law of induced e.m.f **5**
(b) Find the radius of an orbit of an electron moving at a rate of $2 \times 10^7 \text{m/s}$ in a uniform magnetic field of $1.20 \times 10^{-3} \text{T}$. **3**
- (a) Explain the flow of A.C through a capacitor. **5**
(b) A 1.25cm diameter cylinder is subjected to a load of 2500kg. Calculate the stress on the bar in mega pascals. **3**
- (a) State and explain Heisenberg's uncertainty principle. **5**
(b) The current flowing into the base of a transistor is $100\mu\text{A}$. Find the collector current I_C and emitter current I_E if the current gain B is 100. **3**
- (a) What is inner shell transition? Apply it to produce x-rays. **5**
(b) The half life of ${}_{38}\text{Sr}^{91}$ is 9.70 hours. Find its decay constant. **3**

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Roll No. _____ to be filled in by the candidate.

Paper Code	8	4	7	7
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Physics (Objective Type)**Sessions; 2012-2014, 2013-2015 & 2014-2016****Time: 20 Minutes****Marks: 17**

NOTE: Write answers to the questions on objective answer sheet provided. Four possible answers A,B,C & D to each question are given. Which answer you consider correct, fill the corresponding circle A,B,C or D given in front of each question with Marker or pen ink on the answer sheet provided.

1.1. The open loop gain of amplifier is of the order of:

- (A) 10^5 (B) 10^6 (C) 10^4 (D) 10^3

2. We can find from de Broglie formula:

- (A) Wavelength (B) Amplitude of wave (C) Speed of wave (D) Frequency of wave

3. Energy of black body radiation depends upon:

- (A) Nature of surface of body (B) Nature of material of body
(C) Shape and size of body (D) Temperature of the body

4. The following gas was identified in the sun using spectroscopy:

- (A) Hydrogen (B) Helium (C) Carbon (D) Nitrogen

5. When γ -rays are emitted, the nuclear mass:

- (A) Decreases by 4 units (B) Does not change (C) Increases by 2 units (D) Increases by 1 units

6. Which of the followings are not hadrons?

- (A) Muons (B) Mesons (C) Protons (D) Neutrons

7. Selenium is a:

- (A) Conductor (B) Photoconductor (C) Insulator (D) Semiconductor

8. Capacitance of a capacitor does not depend upon:

- (A) Distance between plates (B) Area of plates
(C) Electric field between plates (D) medium between plates

9. Kirchhoff's voltage rule is a way of stating conservation of:

- (A) Energy (B) Momentum (C) Charge (D) Angular momentum

10. If F_1 and F_2 are 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) $F_1 = 4F_2$

11. Which of the following is not accurate measuring device?

- (A) Digital multimeter (B) CRO (C) Potentiometer (D) Voltmeter

12. Self inductance does not depend upon:

- (A) Number of turns of the coil (B) Area of cross-section of the core
(C) Nature of material of the core (D) Current through inductor

13. Efficiency of transformer is not affected by:

- (A) Input voltage (B) core of transformer
(C) Insulation between sheets (D) Resistance of coils

14. In RLC series circuit at resonance the phase difference between capacitor and inductor reactances is:

- (A) 90° (B) 270° (C) 0° (D) 180°

15. Electrons vibrating 94,000 times each second will produce radio waves of frequency.

- (A) 94Hz (B) 940Hz (C) 940KHz (D) 94KHz

16. Which of the followings does not undergo plastic deformation?

- (A) Copper (B) Wrought iron (C) Lead (D) Glass

17. The gain of transistor amplifier depends upon.

- (A) Resistance connected with collector (B) Resistance connected at base
(C) Input voltage (D) Output voltage

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

Subject Code 6 0 4 7

Physics (Essay Type)

Sessions; 2012-2014, 2013-2015 & 2014-2016

Time: 3:10 Hours

Marks: 83

Section - I**2- Write short answers of any eight parts from the following.****2 x 8 = 16**

- i. Show that ε and $\frac{\Delta\phi}{\Delta t}$ have same units.
- ii. What is time constant?
- iii. What is Lorentz force?
- iv. Write down the four properties of electric field lines.
- v. What do you mean by Eddy current?
- vi. Can a step-up transformer increase the power level?
- vii. Why the resistance of an ammeter should be very low?
- viii. Do electrons tend to go to region of high potential or of low potential?
- ix. Why does the picture on a T.V screen become distorted when a magnet is brought near the screen?
- x. Does the induced emf always act to decrease the magnetic flux through a circuit?
- xi. How can you identify that which plate of a capacitor is positively charged?
- xii. How can you use a magnetic field to separate isotopes of chemical elements?

3- Write short answers of any eight parts from the following.**2 x 8 = 16**

- i. What is meant by Hysteresis pass?
- ii. Define conventional current and electronic current.
- iii. Why ordinary silicon diodes do not emit light?
- iv. Define peak value and peak to peak value.
- v. Define Crystalline solids and glassy solids.
- vi. Define stress and strain.
- vii. A sinusoidal current has rms value of 10A. What is the maximum or peak value?
- viii. How does doubling the frequency effect the reactance of: (a). an inductor. (b). a capacitor.
- ix. The anode of a diode is 0.2V positive with respect to its cathode. Is it forward biased?
- x. Is the filament resistance lower or higher in a 500W, 220V light bulb than in a 100W, 220V bulb?
- xi. What are the difficulties in testing whether the filament of a lighted bulb obeys Ohm's law?
- xii. What is the net charge on a p -type or a n -type substance?

4- Write short answers of any six parts from the following.**2 x 6 = 12**

- i. When does light behave as a wave? When does it behave as a particle?
- ii. What happens to total radiation energy from a black body if its absolute temperature is doubled?
- iii. What advantages an electron microscope has over an optical microscope?
- iv. What fraction of radioactive sample decay after two half lives have elapsed?
- v. What are background radiations? Name its two sources.
- vi. What factors make a fusion reaction difficult to achieve?
- vii. What do we mean when we say that atom is excited?
- viii. Define (a). Absorbed dose. (b). Gray.
- ix. Define (a). Population inversion. (b). Metastable state.

Section - II

NOTE: Answer any three questions from the following.

8x3=24

5. (a) What is electric potential? Find electric potential at a point due to a point charge. 05
 (b) How many electrons pass through an electric bulb in one minute if the 300mA current is passing through it? 03
6. (a) How can you find e/m of an electron? Explain. 05
 (b) A square coil of side 16cm has 200 turns and rotate in uniform magnetic field of magnitude 0.05T. 03
 If the peak emf is 12V, what is the angular velocity of the coil?
7. (a) What do you mean by a Hysteresis loop? Explain its salient features. 05
 (b) What is the resonant frequency of a circuit which includes a coil of inductance 2.5H and a capacitance of $40\mu F$? 03
8. (a) What is an amplifier? Use transistor as an amplifier and find the gain of the amplifier. 05
 (b) A particle of mass 5.0mg moves with speed of 8.0 m/s. Calculate its de-Broglie wave-length. 03
9. (a) Give three postulates of Bohr's model and calculate the radius of first orbit of hydrogen atom. 05
 (b) A 75kg person receives a whole body radiation dose of 24 mrad delivered by α -particles for 03
 which RBE factor is 12. Calculate the absorbed energy in Joules.

Section -III (Practical)

10.A Answer any four parts from the following.

2x4=08

- (i). Why is galvanometer shunted?
- (ii). Why the galvanometer shows half deflection upon closing two keys?
- (iii). Define volt and ohm.
- iv). Can you use a D.C voltmeter in A.C circuit?
- v). What are the different parts of a transistor?
- vi). What is work function?
- vii). What is OR-gate? Draw its symbol. Also draw truth table.
- viii). Write down truth table of exclusive NOR- gate.
3. Write down procedure for finding the resistance of a wire using slide wire bridge. 03

OR

Write down the procedure for studying the variation in electric current with intensity of light using photocell.

Answer the following questions on the basis of graph drawn below.

04

Graph is plotted between Voltage $\frac{1}{V}$ and Resistance(ohm) on the back page at No. A.

- i. What do you infer from graph? (ii). Find the resistance of voltmeter from graph.

OR

Graph is plotted between Q and $I\alpha \frac{1}{d^2} cm^{-2}$ on the back page at No. B.

- i. What do you infer from graph? (ii). Find the slope of graph.



Roll No. _____ to be filled in by the candidate.

Paper Code	4	4	7	1
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Physics (Objective Type)

Session: 2015-2017 Group-I

Time: 20 Minutes

Marks: 17

NOTE: Write answers to the questions on objective answer sheet provided. Four possible answers A,B,C & D to each question are given. Which answer you consider correct, fill the corresponding circle A,B,C or D given in front of each question with Marker or pen ink on the answer sheet provided.

1.1. The electric field intensity due to an infinite sheet of charge is:

(A) $\vec{E} = \frac{\sigma}{2\epsilon_0} \hat{r}$

(B) $\vec{E} = \frac{2\sigma}{\epsilon_0} \hat{r}$

(C) $\vec{E} = \frac{1}{2\sigma\epsilon_0} \hat{r}$

(D) $\vec{E} = \frac{\sigma}{\epsilon_0} \hat{r}$

2. The amount of energy equal to $1.6 \times 10^{-19} \text{J}$, is called:

(A) One volt

(B) One milli volt

(C) One electron volt

(D) One mega electron volt

3. Thermo-couple converts heat energy into:

(A) Atomic energy

(B) Solar energy

(C) Electrical energy

(D) Nuclear energy

4. If the number of turns become double but length remain same, then magnetic field in the solenoid become.

(A) Zero

(B) remain same

(C) half

(D) double

5. The SI unit of "B" is tesla which is equal to:

(A) $\text{NA}^{-2}\text{m}^{-2}$

(B) $\text{NA}^{-2}\text{m}^{-1}$

(C) $\text{NA}^{-1}\text{m}^{-2}$

(D) $\text{NA}^{-1}\text{m}^{-1}$

6. The emf produced by an alternating current generator is:

(A) $NwAB \sin \theta$

(B) $NwAB \cos \theta$

(C) $NwAB \sin 2\theta$

(D) $NwAB \cos 2\theta$

7. In D.C generator, split rings act as:

(A) Capacitor

(B) Commutator

(C) Inductor

(D) Resistor

8. The F.M transmission frequencies range from:

(A) 88Hz to 108Hz

(B) 88KHz to 108KHz

(C) 88MHz to 108MHz

(D) 88GHz to 108GHz

9. When 10V are applied to an A.C circuit, the current flowing in it is 100mA. Its impedance is:

(A) 100Ω

(B) 10Ω

(C) 1000Ω

(D) 1Ω

10. The critical temperature for aluminium as superconductor is:

(A) 7.2 K

(B) 1.18 K

(C) 4.2 K

(D) 3.72 K

11. Photo diode is used for detection of:

(A) Heat

(B) Magnet

(C) Current

(D) Light

12. The number of terminals in a semiconductor diode are:

(A) 2

(B) 3

(C) 4

(D) 5

13. When an electron combines with a positron, we gain.

(A) one photon

(B) three photons

(C) two photons

(D) four photons

14. The Compton shift in wavelength will be maximum when angle of scattering is:

(A) 90°

(B) 45°

(C) 180°

(D) 30°

15. For Paschen series, the value of "n" starts from:

(A) 2

(B) 4

(C) 6

(D) 8

16. Which of the following is similar to electron:

(A) β - Particle

(B) α - Particle

(C) Neutron

(D) Proton

17. The element formed by radioactive decay is called:

(A) Father element

(B) Mother element

(C) Parent element

(D) Daughter element

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

**Session; 2015-2017
Group-I**

Physics (Essay Type)

Time: 2:40 Hours

Marks: 68

Section - I

2- Write short answers of any eight parts from the following.

2 x 8 = 16

- i. State Gauss's Law and write its formula
- ii. Show that $\frac{1 \text{ Volt}}{\text{metre}} = \frac{1 \text{ Newton}}{\text{Coulomb}}$.
- iii. Define electron volt and prove that $1 \text{ eV} = 1.6 \times 10^{-19} \text{ J}$.
- iv. Define capacitance of capacitor and write its formula.
- v. What is the function of grid?
- vi. Why the voltmeter should have a very high resistance?
- vii. Define sweep voltage.
- viii. State Lenz's Law.
- ix. Define Henry.
- x. Show that ϵ and $\frac{\Delta \phi}{\Delta t}$ have the same units.
- xi. Why does the picture on a TV screen become distorted when a magnet is brought near the screen?
- xii. Can a D.C motor be turned into a D.C generator? What changes are required to be done?

3- Write short answers of any eight parts from the following.

2 x 8 = 16

- i. A potential difference is applied across the ends of copper wire. What is the effect on drift velocity of free electrons by decreasing the length and temperature of the wire.
- ii. Is filament resistance lower or higher in a 500W, 220V bulb than in 100W 220V bulb.
- iii. How many times per second will an incandescent lamp reach maximum brilliance when connected to a 50Hz source?
- iv. In a R-L circuit, will the current lags or leads the voltage? Illustrate your answer by a vector diagram.
- v. What is meant by strain energy? How can it be determined from the force-extension graph?
- vi. Why charge carriers are not present in the depletion region?
- vii. What is short circuit and open circuit?
- viii. Can electrolysis take place with the help of an A.C source?
- ix. What is semi conductor diode?
- x. What is meant by hysteresis loss?
- xi. Why ordinary silicon diode do not emit light?
- xii. What is solar cell? Give its uses.

4- Write short answers of any six parts from the following.

2 x 6 = 12

- i. Does the dialation mean the time really pass more slowly in moving system or that it only seems to pass more slowly?
- ii. If the following particles have same energy which has the shortest wavelength alpha particle or neutron?
- iii. Discuss the advantages and disadvantages of nuclear power compare to the use of fossil fuel generated power.
- iv. Explain why LASER action could not occur without population inversion between atomic levels?
- v. Distinguish between stimulated emission and spontaneous emission.
- vi. Find mass 'm' of moving object with speed 0.8C.
- vii. What do we mean by the term critical mass?
- viii. Define decay constant.
- ix. State the principle of operation of solid state detector.

Section - II

NOTE: Answer any three questions from the following.

8x3=24

5. (a) Define electric potential. Derive an equation for electric potential at a point due to a point charge. 05
(b) 1×10^7 electrons pass through a conductor in $1 \mu\text{s}$. Find current in amperes flowing through conductor. 03
Electronic charge is $1.6 \times 10^{-19} \text{ C}$
6. (a) What is galvanometer? How can it be converted into: (a). Ammeter. (b). Voltmeter. 05
(b) A coil of 10 turns and 35 cm^2 area is in a perpendicular magnetic field of 0.5T. The coil is pulled out of the field in 1.0s. Find the induced emf in the coil as it is pulled out of the field. 03
7. (a) How the transistor can be used as an amplifier? Explain in detail with circuit diagram and calculate its gain. 05
(b) What is the resonant frequency of a circuit which includes a coil of inductance 2.5H and a capacitance $40 \mu\text{F}$. 03
8. (a) State the postulates of the special theory of relativity. Also write results of the special theory of relativity with out going into their mathematical derivations. 05
(b) A 1.25cm diameter cylinder is subjected to a load of 2500kg. Calculate the stress on the bar in mega pascals. 03
9. (a) Write down the postulates of Bohr's atomic model. Show that Bohr radii and their energies are quantized. 05
(b) A 75kg person receives a whole body radiation dose of 24 m-rad, delivered by α -particles for which RBE is 12 03
calculate: (i) The absorbed energy in joules. (ii). the equivalent dose in rem.



Roll No. _____ to be filled in by the candidate.

Paper Code	4	4	7	2
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Physics (Objective Type)

Session: 2015-2017
Group-II

Time: 20 Minutes

Marks: 17

NOTE: Write answers to the questions on objective answer sheet provided. Four possible answers A,B,C & D to each question are given. Which answer you consider correct, fill the corresponding circle A,B,C or D given in front of each question with Marker or pen ink on the answer sheet provided.

- 1.1. If the distance between two point charges is halved, the electric intensity becomes:
 - (A) half
 - (B) $\frac{1}{4}$ times
 - (C) double
 - (D) 4 times
2. The drum in photo copier is coated with layer of:
 - (A) Aluminium
 - (B) Copper
 - (C) Selenium
 - (D) Silver
3. A rheostat can operate as:
 - (A) Amplifier
 - (B) Potential divider
 - (C) Oscillator
 - (D) Transformer
4. Force on a moving charge in a magnetic field is given by:
 - (A) $F=q(\vec{B} \times \vec{V})$
 - (B) $F=q(\vec{V} \times \vec{B})$
 - (C) $F=q(\vec{B} + \vec{V})$
 - (D) $F=q(\vec{B} - \vec{V})$
5. Current passing through the coil of galvanometer is:
 - (A) $\frac{C\theta}{BAN}$
 - (B) $\frac{C\theta N}{BA}$
 - (C) $\frac{NAB}{C\theta}$
 - (D) $\frac{AN}{BC\theta}$
6. One Henry is:
 - (A) VsA
 - (B) VsA²
 - (C) VsA⁻¹
 - (D) V²sA⁻¹
7. If the coil is wound on an iron core, the magnetic flux through it will:
 - (A) Zero
 - (B) Increases
 - (C) Decreases
 - (D) Remain constant
8. One of the source of an A.C voltage is:
 - (A) Motor
 - (B) Battery
 - (C) UPS
 - (D) Solar cell
9. If I_0 is the peak value of A.C current, then the root mean square(rms) value of current will be:
 - (A) $I_{rms} = \frac{I_0}{2}$
 - (B) $I_{rms} = \frac{\sqrt{2}}{I_0}$
 - (C) $2\sqrt{I_0}$
 - (D) $I_{rms} = \frac{I_0}{\sqrt{2}}$
10. The crystalline structure of NaCl is:
 - (A) Cubical
 - (B) Hexagonal
 - (C) Triagonal
 - (D) Tetragonal
11. A diode characteristics curve is a plot between:
 - (A) Current and resistance
 - (B) Voltage and time
 - (C) Voltage and current
 - (D) Current and time
12. Voltage gain of the common emitter npn-transistor as an amplifier is:
 - (A) $\beta \frac{r_{ie}}{R_c}$
 - (B) $\beta \frac{I_c}{R_c}$
 - (C) $\beta \frac{V_c}{R_c}$
 - (D) $\beta \frac{R_c}{r_{ie}}$
13. 0.1 Kg mass will be equivalent to the energy:
 - (A) 5×10^8 Joules
 - (B) 6×10^{19} Joules
 - (C) 9×10^{16} Joules
 - (D) 9×10^{15} Joules
14. The maximum Kinetic energy of emitted photoelectrons depends upon:
 - (A) the intensity of incident light
 - (B) frequency of the incident light
 - (C) metal surface
 - (D) both frequency of incident light and metal surface
15. Balmer empirical formula explains the electromagnetic radiation of any excited atom in terms of their:
 - (A) Energy
 - (B) Mass
 - (C) Wavelength
 - (D) Momentum
16. Gm-counter uses:
 - (A) Alcohol only
 - (B) Bromine
 - (C) Argon
 - (D) Neon and bromine
17. How many times, the α - Particle is more massive than electron?
 - (A) 6332
 - (B) 7332
 - (C) 8332
 - (D) 9332

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

Physics (Essay Type)**Session; 2015-2017**
Group-II**Time: 2:40 Hours****Marks: 68****Section - I****2- Write short answers of any eight parts from the following.****2 x 8 = 16**

- i. State Gauss's Law.
- ii. Define electric potential difference with units.
- iii. Write down two uses of CRO.
- iv. Why the resistance of ammeter should be low?
- v. What is self induction, write down its units.
- vi. Do electrons tend to go to region of high potential or of low potential?
- vii. The potential is constant throughout a given region of space. Is the electrical field zero or non-zero in this region?
- viii. Write down the formula for magnetic force on current carrying conductor in a uniform magnetic field of strength $\vec{B}$.
- ix. Is it possible to orient a current loop in a uniform magnetic field such that the loop will not tend to rotate, explain.
- x. Does the induced emf always act to decrease the magnetic flux through a circuit?
- xi. Four unmarked wires emerge from a transformer, what steps would you take to determine the turns ratio?
- xii. How would you position a flat loop of wire in a changing magnetic field, so that there is no emf induced in the loop?

3- Write short answers of any eight parts from the following.**2 x 8 = 16**

- i. What are the difficulties in testing whether the filament of a lighted bulb obeys Ohm's law?
- ii. Do bends in a wire affect its electrical resistance? Explain.
- iii. Is the filament resistance low or higher in a 500W, 220V light bulb than in a 100W, 220V bulb?
- iv. Explain the conditions under which electromagnetic waves are produced from a source?
- v. How does doubling the frequency affect the reactance of a capacitor?
- vi. Discuss the mechanism of electrical conduction by holes and electrons in a pure semiconductor element?
- vii. What is meant by A.M and F.M?
- viii. What are superconductors? Give examples.
- ix. Define tensile stress and volumetric stress?
- x. Why a photo diode is operated in reverse biased state?
- xi. Why is the base current in a transistor very small?
- xii. What is the net charge on a n-type or a p-type substance?

4- Write short answers of any six parts from the following.**2 x 6 = 12**

- i. What are measurements on which two observers in relative motion will always agree upon?
- ii. We do not notice de-Broglie wavelength for a pitched cricket ball. Explain why?
- iii. Will higher frequency light eject greater number of electrons than low frequency light?
- iv. Can electron in ground state of hydrogen absorb a photon of energy 13.6eV and greater than 13.6eV.
- v. What do you understand by background radiation? State two sources of this radiation.
- vi. Name different quarks according to Gell-Mann and G.Zweig quark theory.
- vii. What are advantages of laser over ordinary light?
- viii. What do you mean by the term critical mass?
- ix. Differentiate between Hadrons and leptons.

Section - II**NOTE: Answer any three questions from the following.****8x3=24**

5. (a) Define electric flux. Calculate the electric flux through a sphere having a charge (+q) at its center. **05**
(b) The resistance of an iron wire at 0°C is $1 \times 10^4 \Omega$. What is the resistance at 500°C? The temperature coefficient of resistance of iron is $5.2 \times 10^{-3} \text{K}^{-1}$. **03**
6. (a) State and explain Faraday's law in detail. **05**
(b) Find the radius of an orbit of an electron moving at a rate of $2 \times 10^7 \text{m/s}$ in a uniform magnetic field of $1.2 \times 10^{-3} \text{T}$. **03**
7. (a) What is operational amplifier? Describe operational amplifier as non inverting amplifier. Calculate its gain. **05**
(b) Find the value of the current and inductive reactance, when A.C voltage of 220V at 50Hz is passed through an inductor of 10H. **03**
8. (a) What is photoelectric effect? How its different results were successfully explained by Einstein? **05**
(b) A 1.25cm diameter cylinder is subjected to the load of 3000Kg. Calculate the stress on the cylinder in mega pascals. **03**
9. (a) Define LASER and explain population inversion and laser action. **05**
(b) The half life of $^{91}_{38}\text{Sr}$ is 9.70 hours. Find its decay constant. **03**

Roll No. _____ to be filled in by the candidate.

Paper Code	8	4	7	1
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Sessions; 2013-2015 & 2014-2016
Group-I

Physics (Objective Type)

Time: 20 Minutes

Marks: 17

NOTE: Write answers to the questions on objective answer sheet provided. Four possible answers A, B, C & D to each question are given. Which answer you consider correct, fill the corresponding circle A, B, C or D given in front of each question with Marker or pen ink on the answer sheet provided.

- The force experienced by a unit +ve charge placed at a point in an electric field is called as:
(A) Coulomb's force (B) Magnetic force (C) Loreutz's force (D) Electric field intensity
- The unit of RC is:
(A) Volt (B) Second (C) Coulomb (D) Ampere
- Kirchhoff's first rule is manifestation of law of conservation of:
(A) Mass (B) Energy (C) Momentum (D) Charge
- Electrical energy is measured in:
(A) Kilowatt (B) Horse Power (C) Kilowatt hour (D) Watt
- A charge particle moving in magnetic field experiences a force given by:
(A) $F = qVB \sin \theta$ (B) $F = qVB \cos \theta$ (C) $F = \frac{qV}{B} \cos \theta$ (D) $F = \frac{qV}{B} \sin \theta$
- The SI unit of induced emf is:
(A) Ohm (B) Tesla (C) Volt (D) Henry
- If we make the magnetic field stronger, the value of induced current is:
(A) decreased (B) increased (C) vanished (D) constant
- Power dissipation in a pure inductive circuit is:
(A) infinite (B) Zero (C) maximum (D) minimum
- A device through which direct current can not flow is:
(A) inductor (B) capacitor (C) thermistor (D) resistor
- The magnetism produced by electrons within an atom is due to their :
(A) spin motion (B) orbital motion
(C) Both spin and orbital motion (D) vibratory motion
- Conversion of AC into DC is called as:
(A) rectification (B) amplification
(C) oscillation (D) quantization
- The potential barrier for silicon is:
(A) 0.9V (B) 0.8V (C) 0.7V (D) 0.3V
- Aging process of the human body is slowed down by motion at very high speed, is predicted by;
(A) Newton (B) Einstein (C) Faraday (D) Coulomb
- Due to the annihilation of electron and positron, the number of photons produced is:
(A) 1 (B) 2 (C) 3 (D) 4
- Helium Neon laser discharge tube contains Neon.
(A) 15% (B) 18% (C) 25% (D) 85%
- The number of protons in any atom are equal to the number of:
(A) electrons (B) neutrons (C) positrons (D) mesons
- Geiger Muller counter can be used to detect:
(A) charge (B) mass (C) $\frac{\text{charge}}{\text{mass}}$ (D) nuclear radiations

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

Sessions; 2013-2015 & 2014-2016
Group-I

Physics (Essay Type)

Time: 3:10 Hours

Marks: 83

Section - I

2- Write short answers of any eight parts from the following.

2 x 8 = 16

- i. Show that ε and $\frac{\Delta\phi}{\Delta t}$ have same units.
- ii. Electric lines of force never cross. Why?
- iii. Write down the factors on which self induction depends?
- iv. Write down four properties of electric field lines.
- v. What is Digital Multimeter?
- vi. Why the voltmeter should have high resistance?
- vii. Why does the picture on a TV screen becomes distorted when a magnet is brought near the screen?
- viii. Is it possible to orient a current loop in a uniform magnetic field such that the loop will not tend to rotate? Explain.
- ix. Suppose that you follow an electric field line due to a positive point charge. Do electric field and potential increases or decreases?
- x. Can an electric motor be used to drive an electric generator with the output from the generator being used to operate the motor?
- xi. Four unmarked wires emerge from a transformer. What steps would you take to determine the turn ratio?
- xii. Do electrons tend to go to region of high potential or of low potential?

3- Write short answers of any eight parts from the following.

2 x 8 = 16

- i. What is difference between emf and terminal potential difference of a cell?
- ii. In a R-L circuit will the current lag or lead the voltage? Illustrate your answer by a vector diagram.
- iii. Why does the resistance of a conductor rise with temperature?
- iv. What is meant by A.M and F.M?
- v. Do bends in a wire affect its electrical resistance? Explain.
- vi. What is choke? Explain.
- vii. What is difference between intrinsic and extrinsic semiconductors?
- viii. Define super conductor and critical temperature.
- ix. What is the net charge on a n -type or a p -type substance?
- x. Explain M.R.I.
- xi. Why is the base current in a transistor very small?
- xii. What is the principle of virtual ground?

4- Write short answers of any six parts from the following.

2 x 6 = 12

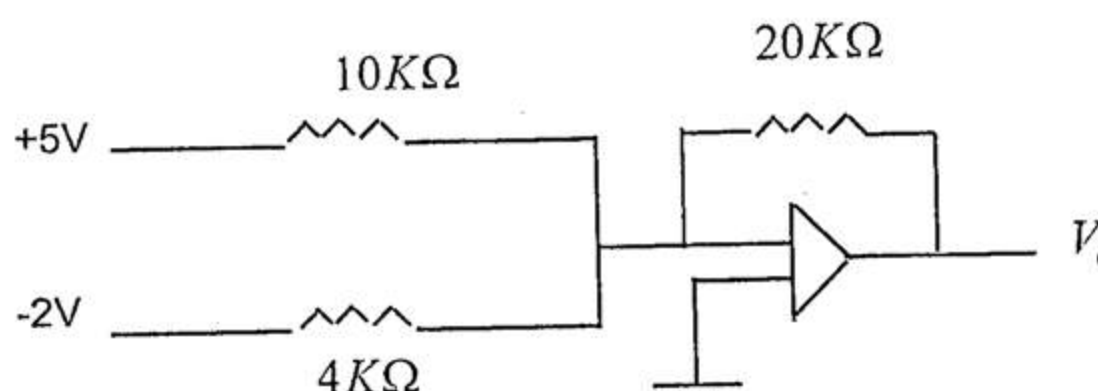
- i. What is meant by inertial and non-inertial frame of reference?
- ii. We do not notice the de Broglie wave-length for a pitched cricket ball. Explain why?
- iii. Is energy conserved when an atom emits a photon of light? Explain.
- iv. What fraction of a radioactive sample decays after two half lives have elapsed?
- v. If someone accidentally swallows an α -source and α β -source, Which would be more dangerous to him? Explain why?
- vi. What do we mean by the term critical mass?
- vii. What are the advantages of lasers over ordinary light?
- viii. What factors make a fusion reaction difficult to achieve?
- ix. Which has the lower energy quanta? Radio waves or x-rays.

Section - II

NOTE: Answer any three questions from the following.

8x3=24

5. (a) What is potentiometer? Describe the principle and construction of potentiometer. How it can be used to measure unknown e.m.f of cell? 05
 (b) Two point charges $+16\mu C$ and $+4\mu C$ are separated by 3.0m. Find and justify the zero- field location. 03
6. (a) Explain the principle, construction and working of a galvanometer. 05
 (b) A metal rod of length 25cm is moving at a speed of 0.5mS^{-1} in a direction perpendicular to a 0.25T magnetic field. Find the emf produced in the rod. 03
7. (a) Find the resonance frequency for RLC-series circuit. 05
 (b) A 1.25cm diameter cylinder is subjected to load of 2500 Kg. calculate the stress on the bar in mega pascals. 03
8. (a) What is the de-Broglie hypothesis and give its experimental verification? 05
 (b) Calculate the output of the op-amp circuit shown in the figure. 03



9. (a) Describe the principle, construction and working of Wilson Cloud Chamber . Also give its use. 05
 (b) Calculate the longest wave-length of radiation for the Paschen series. 03

Section -III (Practical)

10.A Answer any four parts from the following.

2x4=08

- (i). Why the resistance of an ammeter should be very low? Explain briefly.
- (ii). Define Volt and Ohm.
- (iii). Write the truth table of NOT gate with symbol.
- (iv). What is digital system?
- (v). What is photo cell?
- (vi). Draw the circuit diagram of half deflection method.
- (vii). Define current and give its unit.
- (viii). Define resistance and give its unit.

B. Write the procedure to find the resistance of a wire by slide wire bridge. OR

03

Write the procedure to verify truth table for NOR and AND gates.

C. Answer the following questions on the basis of graph. 04

(i). Graph -A: What do you infer from graph?

(ii). Find the slope between I and $\frac{1}{d^2}$.

OR

(i). Graph -B: Find the slope between R and t.

(ii). What do you infer from graph?

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Roll No. _____ to be filled in by the candidate.

Paper Code	8	4	7	2
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Sessions; 2013-2015 & 2014-2016

Physics (Objective Type)

Group-II

Time: 20 Minutes

Marks: 17

NOTE: Write answers to the questions on objective answer sheet provided. Four possible answers A, B, C & D to each question are given. Which answer you consider correct, fill the corresponding circle A, B, C or D given in front of each question with Marker or pen ink on the answer sheet provided.

- 1.1. The force on neutron due to a field intensity of 10^2 N/c is:

(A) Zero N	(B) $1.6 \times 10^{-21} \text{ N}$	(C) $1.6 \times 10^{-19} \text{ N}$	(D) $1.6 \times 10^{-17} \text{ N}$
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2. If time constant in RC-circuit is small, the capacitor is charged or discharged:

(A) Rapidly	(B) At constant rate	(C) slowly	(D) intermediately
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3. Power dissipated as heat in the conductor of resistor R due to electric current I is given by:

(A) $I^2 R$	(B) IR^2	(C) $I^2 Rt$	(D) IRt
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4. The electron gun in CRO consists of:

(A) Indirectly heated cathode	(B) Grid
(C) Three anodes	(D) all of these
5. Two parallel wires carrying currents in the opposite direction:

(A) Repel each other	(B) Attract each other
(C) Have no effect upon each other	(D) They cancel out their individual magnetic field
6. When a coil is moved in a uniform magnetic field, an induced emf is produced due to change in:

(A) Flux density	(B) Electric flux	(C) magnetic flux	(D) magnetic field strength
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7. The principle of an electric generator is based on:

(A) coulomb's law	(B) Ampere's law	(C) Faraday's law	(D) Lenz's law
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8. Voltage across any two lines of a three phase A.C supply is:

(A) 220V	(B) 240V	(C) 300V	(D) 400V
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9. The F.M transmission frequency range from:

(A) 50MHz to 175MHz	(B) 88MHz to 108MHz	(C) 120MHz to 240MHz	(D) 220MHz to 240MHz
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10. The process in which magnetization reduced to zero by reversing the magnetizing current is called:

(A) Coercivity	(B) Hysteresis	(C) Retentivity	(D) Saturation
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11. In a certain circuit, the transistor has a collector current 10mA and a base current of $40 \mu A$ the current gain of the transistor will be:

(A) 125	(B) 200	(C) 250	(D) 300
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12. Which of the followings are charge carriers inside a P-type crystal.

(A) positrons	(B) protons	(C) holes	(D) electrons
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13. The momentum of a photon of frequency f is:

(A) $\frac{hc}{f}$	(B) $\frac{hf}{c}$	(C) $\frac{c}{hf}$	(D) $\frac{f}{hc}$
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14. Blue light has frequency $7.5 \times 10^{14} \text{ Hz}$. Its energy is:

(A) 9.3eV	(B) 6.2eV	(C) 5.6eV	(D) 3.1eV
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15. Total energy of an electron in an orbit around the nucleus is sum of:

(A) Rotational and vibrational energy	(B) Vibrational and Kinetic energy
(C) Rotational and Kinetic energy	(D) Potential and Kinetic energy
16. One upquark and two down quarks makes a:

(A) Proton	(B) neutron	(C) meson	(D) Baryon
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17. The most useful tracer is:

(A) Carbon-14	(B) Cobalt-60	(C) Iodine-131	(D) Strontium-90
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Roll No. _____ (To be filled in by the candidate)

Sessions; 2013-2015 & 2014-2016
Group-II

Physics (Essay Type)

Time: 3:10 Hours

Marks: 83

Section - I

2- Write short answers of any eight parts from the following.

2 x 8 = 16

- i. Show that ϵ and $\frac{\Delta\phi}{\Delta t}$ have same units.
- ii. Define electron volt. Show that $1\text{eV} = 1.6 \times 10^{-19}\text{J}$.
- iii. What is CRO? write its two uses.
- iv. Why the voltmeter should have a very high resistance?
- v. The potential is constant through out a given region of space. Is the electric field zero or non-zero in the region? Explain.
- vi. Is any work done by the magnetic force that acts on the charge q ? Explain.
- vii. The circuit of sensitive electronics devices are often enclosed with in metal boxes. Why?
- viii. Can a D.C motor be turned in to D.C generator? What changes are required to be done?
- ix. State Faraday's law of electromagnetic induction. Write its mathematical form .
- x. What is commutator? What is its function in D.C generator?
- xi. Why does the picture on a TV screen become distorted when a magnet in brought near the screen?
- xii. Do protons tend to go to region of high potential or of low potential? Explain.

3- Write short answers of any eight parts from the following.

2 x 8 = 16

- i. On a carbon resistor if the colours of 1st band is red , and 2nd is blue, 3rd is green and fourth is silver. Find its resistance.
- ii. Is the filament resistance lower or higher in a 500W 220V light bulb than in a 100W and 200V bulb?
- iii. What is a thermistor? Write down its one application.
- iv. What is meant by A.M and F.M?
- v. Distinguish between peak value and peak to peak value.
- vi. What the area of hysteresis loop shows?
- vii Distinguish between intrinsic and extrinsic semiconductors.
- viii Define the terms ultimate tensile stress and yield point.
- ix Why is the base current in a transistor very small?
- x. Write down two uses of light emitting diodes.
- xi. What is the effect of forward and reverse biasing of a diode on the width of depletion region?
- xii. How many times per second will an incandescent lamp reach maximum brilliance when connected a 50Hz source

4- Write short answers of any six parts from the following.

2 x 6 = 12

- i. When light shines on a surface. Is momentum transferred to the metal surface?
- ii. What are the advantages of lasers over ordinary light?
- iii. A particle which produces more ionization is less penetrating . Why?
- iv. What is dual nature of light?
- v. Can pair production take place in vacuum? Explain.
- vi. How can radioactivity help in the treatment of cancer?
- vii. What do we mean by radioactive tracer?
- viii. What factors make a fusion reaction difficult to achieve?
- ix. Write two postulates of Bohr's Theory.

Section - II

8x3=24

NOTE: Answer any three questions from the following.

- | | |
|--|----|
| 5. (a) Define electrical power, derive relation for power dissipation in resistor? | 05 |
| (b) Two point charges $q_1 = -8.0 \times 10^{-8} \text{C}$ and $q_2 = +4.0 \times 10^{-8} \text{C}$ are separated by a distance of 3.0m. Find and justify the zero field location. | 03 |
| 6. (a) Derive an expression for energy stored in an inductor. Also express in terms of magnetic field. | 05 |
| (b) A power line 10.0m high carries a current 200A. Find the magnetic field of the wire at the ground. | 03 |
| 7. (a) Discuss the behaviour of R-L series circuit with an A.C source. Calculate the impedance of R-L circuit by drawing impedance diagram also phase angle. | 05 |
| (b) A wire 2.5m long and cross-section area 10^{-5}m^2 is stretched 1.5mm by a force of 100N in the elastic region. Calculate : (i). The strain. (ii). Young's Modulus. | 03 |
| 8. (a) Describe transistor as voltage amplifier. Derive a relation for the gain of the amplifier. | 05 |
| (b) A particle of mass 5.0mg moves with a speed of 8.0m/s. Calculate its de Broglie's wavelength. | 03 |
| 9. (a) Define Isotopes. How isotopes are determined by mass spectrograph? | 05 |
| (b) Calculate the longest wavelength of radiation for the Paschen series. | 03 |

Section -III (Practical)

2x4=08

10.A Answer any four parts from the following.

- | | |
|--|--|
| (i). What is meant by half deflection in experiment to find the resistance of galvanometer? | |
| (ii). Draw circuit diagram of experiment to find resistance of voltmeter. | |
| (iii). Give symbol and truth table of NOR gate. | |
| (iv). Enlist the four apparatus components used in experiment to find resistance by Neon flash lamp. | |
| (v). Define excitation potential. | (vi). Define time constant, |
| (vii). Does tungsten filament bulb obey ohm's law? | (viii). How does charge increase in capacitor? |
| B. Write down the procedure of experiment to find the resistance of a wire by slide wire bridge. | 03 |

OR

Write down the procedure of experiment to study the characteristics of semiconductor diode.

04

C. Answer the following questions given below on the basis of graph.

- | | |
|---|---|
| (i). Graph.A: What do you infer from graph? | (ii). Find the value of $\frac{1}{d^2}$ for $13 \mu\text{A}$ current. |
|---|---|

OR

- | | |
|--|-------------------------------------|
| (i). Graph.B: Find the slope of the graph. | (ii). What did the slope represent? |
|--|-------------------------------------|

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Roll No. _____ to be filled in by the candidate.

Paper Code	4	4	7	5
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Sessions: 2015-2017 & 2016-2018

Physics (Objective Type)

Time: 20 Minutes

Marks: 17

NOTE: Write answers to the questions on objective answer sheet provided. Four possible answers A,B,C & D to each question are given. Which answer you consider correct, fill the corresponding circle A,B,C or D given in front of each question with Marker or pen ink on the answer sheet provided.

1.1- Maximum Compton shift is observed at:

- (A) 0° (B) 90° (C) 180° (D) 45°

2.. Bremsstrahlung radiations are example of:

- (A) Atomic spectra (B) Molecular spectra (C) Continuous spectra (D) Discrete spectra

3. What is different in isotopes?

- (A) number of protons (B) number of neutrons (C) number of electrons (D) Charge number

4. Circulation of blood is studied by radio isotope:

- (A) carbon-14 (B) carbon-12 (C) cobalt-60 (D) sodium-24

5. if electric lines of force are equally spaced the electric field is:

- (A) uniform (B) non-uniform (C) weak (D) strong

6. Drum of Photocopier is made of:

- (A) Copper (B) Toner (C) Selenium (D) Aluminium

7. Magnetic effect of current is used in:

- (A) Toaster (B) Electric motor (C) Electric iron (D) D.C battery

8. Two current carrying parallel conductors are lying in same direction, they.

- (A) form magnetic dipole (B) attract each other (C) repel each other (D) have no effect

9. If current flowing through a solenoid becomes four times, then magnetic field inside it becomes:

- (A) two times (B) three times (C) four times (D) half

10. In A.C, inductor behaves as:

- (A) Capacitor (B) Resistor (C) Commutators (D) Transistor

11. In A.C generator when plane of coil is perpendicular to the magnetic field, then output of generator is:

- (A) NWAB (B) $2\pi f$ (C) maximum (D) zero

12. In metal detectors, we use:

- (A) RL circuit (B) RC circuit (C) LC circuit (D) any of these

13. In frequency modulation, which factor is changed?

- (A) Amplitude of carrier waves (B) Frequency of carrier wave
(C) Amplitude of signal (D) Frequency of signal

14. A material which is insulator at OK and conduct at room temperature is:

- (A) Silver (B) Lead (C) Germanium (D) Polythene

15. Doping is made comparatively larger in:

- (A) emitter (B) base (C) collector (D) P-type semi-conductors

16. In put resistance of op-amplifier is of the order of:

- (A) Few ohms (B) Mega ohms (C) Milli ohms (D) Micro ohms

17. Light of 4.5 eV is incident on a cesium surface and stopping potential is 0.25V, maximum K.E of emitted electrons is:

- (A) 4.5 eV (B) 4.25 eV (C) 4.75 eV (D) 0.25 eV

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

Sessions: 2015-2017 & 2016-2018

Physics (Essay Type)

Time: 2:40 Hours

Section - I

Marks: 68

2- Write short answers of any eight parts from the following.

2 x 8 = 16

- What is capacitor? Define the capacitance.
- Write in detail about electron Volt.
- How can you identify that which plate of a capacitor is positively charged?
- If a 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?
- Define magnetic flux and mention the factors upon which it depends.
- Write down the uses of C.R.O.
- Why the voltmeter should have a very high resistance?
- Is it possible to orient a current loop in uniform magnetic field such that the loop will not tend to rotate?
- State Faraday's law of electromagnetic induction and write its mathematical expression.
- What is D.C motor? Write down the parts of D.C motor.
- Can a D.C motor be turned into D.C generator? What changes are required to be done?
- Does the induced emf always act to decrease the magnetic flux through a circuit?

3- Write short answers of any eight parts from the following.

2 x 8 = 16

- Define ohm's law. Also define ohmic and non-ohmic devices.
- What is wheat stone bridge? Sketch its circuit diagram.
- Why does the resistance of a conductor rise with temperature?
- Write two properties of parallel resonance circuit.
- How does doubling the frequency affect the reactance of: (a) an inductor. (b). a capacitor.
- A sinusoidal current has rms value of 10 A. What is the maximum or peak value?
- Define retentivity and coercivity.
- Distinguish between crystalline and amorphous solids.
- Distinguish between intrinsic and extrinsic semi-conductor.
- What is photodiode? Write down its any two applications.
- Why charge carrier are not present in the depletion region?
- What is the effect of forward and reverse biasing of a diode on the width of depletion region?

4- Write short answers of any six parts from the following.

2 x 6 = 12

- Define pair production and annihilation of matter.
- Which has the lower energy quanta? Radio wave or X-rays.
- Is it possible to create a single electron from energy? Explain.
- Is energy conserved when an electron emits a photon of light.
- Define normal population and population inversion.
- How can radioactivity help in the treatment of cancer?
- A particle which produces more ionisation is less penetrating. Why?
- Why are heavy nuclei unstable?
- What are the basic forces in nature?

Section - II**NOTE: Answer any three questions from the following.**

8x3=24

- State Gauss's Law. Derive a relation for electric intensity at a point near an infinite sheet of charge. 05
 - A rectangular bar of iron is 2.0cm by 2.0cm in cross-section and 40cm long. Calculate its resistance if the resistivity of iron is $11 \times 10^{-8} \Omega m$. 03
- What is mutual induction? Derive a relation for induced emf in secondary coil. What is unit of mutual inductance? Define it. 05
 - A 20cm wire carrying a current of 10.0A is placed in a uniform magnetic field of 0.30T. If wire makes an angle of 40° with the direction of magnetic field, find the magnitude of the force acting on the wire. 03
- What is transistor? Describe the use of transistor as an amplifier and calculate its voltage gain. 05
 - What is the resonant frequency of a circuit which includes a coil of inductance 2.5H and a capacitance of $40 \mu F$? 03
- What is meant by doping? Give the names of doped materials. How would you obtain n-type and p-type material from pure silicon? Illustrate it by Schematic diagram. 05
 - A 90 KeV x-ray photon is fired at a carbon target and Compton scattering occurs. Find the wavelength of incident photon and scattered photon for scattering angle of 60° . 03
- Write down the postulates of Bohr atom model for hydrogen atom. Also derive the formula for nth orbit radius of Bohr atom model and prove that the Bohr radii are quantized. 05
 - A sheet of lead 5.0mm 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. 03



Roll No. _____ to be filled in by the candidate.

Paper Code	8	4	7	5
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Session; 2014-2016

Physics (Objective Type)

Time: 20 Minutes

Marks: 17

NOTE: Write answers to the questions on objective answer sheet provided. Four possible answers A,B,C & D to each question are given. Which answer you consider correct, fill the corresponding circle A,B,C or D given in front of each question with Marker or pen ink on the answer sheet provided.

- 1.1. The factor $\frac{h}{m_e c^2}$ in Compton equation has the dimension of:

(A) Pressure	(B) Mass	(C) Momentum	(D) Length
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2. Number of series lies in infrared region is:

(A) one	(B) two	(C) three	(D) four
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3. Half life of radon gas is:

(A) 3.8 minutes	(B) 3.8 days	(C) 3.8 seconds	(D) 3.8 months
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4. Neutron was discovered by:

(A) Rutherford	(B) Becquerel	(C) Curie	(D) Chadwick
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5. The potential difference across the two plates of a parallel plates capacitor is doubled, then energy stored in it will be:

(A) two times	(B) four times	(C) eight times	(D) remains constant
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6. Electron volt is a unit of:

(A) Charge	(B) Potential	(C) Resistance	(D) Energy
------------	---------------	----------------	------------
7. mho m^{-1} is the SI unit of:

(A) conductivity	(B) conductance	(C) resistance	(D) capacitance
------------------	-----------------	----------------	-----------------
8. The magnetic force is simply a:

(A) reflecting force	(B) deflecting force	(C) restoring force	(D) gravitational force
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9. Tesla can be written as:

(A) $NA m^{-1}$	(B) $NA^{-1} m^{-1}$	(C) $N^{-1} A m^{-1}$	(D) $NA^{-1} m$
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10. Henry is SI unit of:

(A) current	(B) resistance	(C) magnetic flux	(D) self induction
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11. A step-down transformer:

(A) increases current	(B) decreases current	(C) current remains constant	(D) current becomes infinite
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12. Alternating voltage source changes its polarity _____ in one cycle.

(A) once	(B) twice	(C) thrice	(D) four time
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13. At resonance the impedance of RLC series circuit is:

(A) maximum	(B) zero	(C) minimum	(D) intermediate
-------------	----------	-------------	------------------
14. The SI unit of stress is same as that of:

(A) momentum	(B) pressure	(C) force	(D) length
--------------	--------------	-----------	------------
15. A photo diode can switch its current on or off in:

(A) nano second	(B) milli second	(C) micro second	(D) centi second
-----------------	------------------	------------------	------------------
16. The magnitude of open loop gain of the OP-Amp is of the order of:

(A) 10^7	(B) 10^3	(C) 10^5	(D) 10^2
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17. The SI unit of Planck's constant is:

(A) JS^{-1}	(B) JS	(C) JS^2	(D) JS^{-2}
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Roll No. _____ (To be filled in by the candidate)
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Session;2014-2016**Physics** (Essay Type)**Time: 3:10 Hours****Marks: 83****Section - I****2- Write short answers of any eight parts from the following.****2 x 8 =16**

- | | |
|---|---|
| i. Show that $\frac{N}{C} = \frac{V}{m}$: | ii. Define capacitance and its unit. |
| iii. Electric field lines never cross each other. Why? | iv. Why the voltmeter should have very high resistance? |
| v. Define electric flux and its unit. | vi. Define motional emf. Write down its equation. |
| vii. How the circular trajectory of electron is made visible in e/m experiment? | |
| viii. The potential is constant through a region of space. Is the electric field zero or non zero in the region? Explain. | |
| ix. State right hand rule to find the direction of magnetic force on a charge moving in a magnetic field. | |
| x. How back emf is produced in a motor? Why does its magnitude increase with the speed of motor? | |
| xi. Show that ϵ and $\frac{\Delta\theta}{\Delta t}$ have the same unit. | |
| xii. When the primary coil of a transformer is connected to a.c mains the current in it: | |
| (a) is very small when the secondary circuit is open. | |
| (b). increases when the secondary circuit is closed. Explain these facts. | |

3- Write short answers of any eight parts from the following.**2 x 8 =16**

- | | |
|--|--|
| i. State Kirchoff's 1st and 2nd rule. | |
| ii. Explain why terminal potential difference of a battery decreases when the current drawn from it is increased? | |
| iii. Explain the conditions under which the electromagnetic waves are produced from the source? | |
| iv. Name the device that will: (a). Permit flow of direct current but oppose the flow of alternating current. | |
| (b). Permit flow of alternating current but not the direct current. | |
| v. How does the motion of an electron in a n-type substance differ from the motion of holes in a p-type substance? | |
| vi. Why does resistance of a conductor rise with temperature? | vii. Write two advantages of 3-Phase A.C supply. |
| viii. What is difference between elasticity and plasticity? | ix. What is meant by strain energy? |
| x. Differentiate between tensile and compressive modes of stress. | xi. What is the principle of virtual ground? |
| xii. What is mathematical formula of AND-gate? Write its Truth Table. | |

4- Write short answers of any six parts from the following.**2 x 6 =12**

- | |
|---|
| i. Define threshold frequency and work function. |
| ii. Which photon red, green or blue carries the (a). most energy. (b). most momentum. |
| iii. We don't notice the de Broglie wavelength for a pitched cricket ball. Explain why? |
| iv. What are advantages of lasers over ordinary light? |

- v. What is meant by line spectrum? Explain how line spectrum can be used for the identification of elements.
- vi. What do you mean by dead time of Geiger counter. Write its value.
- vii. What are isotopes? What do they have in common and what are their differences?
- viii. Define half life of a radioactive element.
- ix. What do you mean by the term critical mass.

Section - II

NOTE: Answer any three questions from the following.

8x3=24

5. (a) State and explain Coulomb's law. 05
 (b) A platinum wire has resistance of 10 Ohm at 0°C and 20 Ohm at 273°C . Find the value of temperature co-efficient of resistance of platinum. 03
6. (a) Define mutual induction, also define its unit and derive expression for the mutual induction. 05
 (b) A galvanometer having an internal resistance $R_g = 15.0\Omega$, give full scale deflection with current $I_g = 20.0\text{mA}$. It is to be converted into an ammeter of range 10.0A. Find the value of shunt resistance R_s . 03
05
7. (a) How is a transistor biased in normal operation? Describe the use of transistor as an amplifier. 03
 (b) Find the capacitance required to construct a resonance circuit of frequency 1000KHz with an inductor 5mH. 05
8. (a) State postulates of special theory of relativity. Discuss.(a). Relativity in length.(b). Relativity in mass. 03
 (b) A wire 2.5m long and crosssection area 10^{-5}m^2 is stretched 1.5mm by a force of 100N in the elastic region. Calculate Young's modulus of the material of wire.
9. (a) What is laser? Describe the principle of helium-neon laser. 05
 (b) A sheet of lead 5.0mm 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. 03

Section -III (Practical)

10.A Answer any four parts from the following.

2x4=08

- | | |
|--|---|
| (i). What is the principle of slide wire bridge? | (ii). Define resistance and its unit. |
| (iii). What is capacitance? Give its unit. | (iv). What are Ohmic substances? |
| (v). Define work function. | (vi). What is the rest mass of photon. |
| (vii). What are the applications of gates? | (viii). Write down the truth table of NOT gate. |

B. Write the procedure of experiment to find the resistance of a galvanometer by half deflection method.

03

OR

Write the procedure of experiment of relation between current passing through a tungsten lamp and the potential applied across it.

C. Answer the following questions on the basis of graph.

04

- | | |
|--|------------------------------------|
| (i). Graph -A: What do you infer from graph? | (ii). Find the slope of the graph. |
|--|------------------------------------|

OR

- | | |
|--|------------------------------------|
| (i). Graph -B: What do you infer from graph? | (ii). Find the slope of the graph. |
|--|------------------------------------|

Roll No. _____ to be filled in by the candidate.

(For all sessions)

Paper Code	8	4	7	5
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Physics (Objective Type)

Time: 20 Minutes

Marks: 17

NOTE: Write answers to the questions on objective answer sheet provided. Four possible answers A,B,C & D to each question are given. Which answer you consider correct, fill the corresponding circle A,B,C or D given in front of each question with Marker or pen ink on the answer sheet provided.

- 1.1. Colour of light emitted by LED depends upon:
 (A) its forward biasing (B) its reverse biasing (C) type of material (D) forward current
2. At low temperature, a body emits radiations of:
 (A) shorter wavelength (B) longer wavelength
 (C) high frequency (D) high frequency & shorter wavelength
3. The shortest wavelength in Lyman series is equal to:
 (A) R_H (B) $\frac{R_H}{2}$ (C) $\frac{1}{R_H}$ (D) $\frac{2}{3}R_H$
4. In the reaction, $X + {}^{17}_8O \rightarrow {}^{14}_7N + {}^4_2He$, X is:
 (A) ${}_1^1H$ (B) ${}_1^2H$ (C) ${}_1^0e$ (D) ${}_{-1}^0e$
5. If the charges are doubled and the distance between them is also doubled, then Coulomb's force will be:
 (A) double (B) halved (C) remains same (D) four times
6. A rubber ball of radius 2cm has a charge of $5\mu C$ on its surface, which is uniformly distributed, the value of $\vec{E}$ at its centre is:
 (A) $10NC^{-1}$ (B) Zero (C) $2.5 NC^{-1}$ (D) $5 \times 10^{-6} NC^{-1}$
7. Which one of the following relation is correct?
 (A) joule=volt x ampere (B) joule=coulomb / volt (C) joule=volt / ampere (D) joule=coulomb x volt
8. In carbon resistors, which colour band indicates the tolerance of $\pm 10\%$?
 (A) White (B) Silver (C) Gold (D) Violet
9. For an open circuit, terminal potential difference 'Vt' is:
 (A) $V_t = 2emf$ (B) $V_t = emf$ (C) $V_t > emf$ (D) $V_t < emf$
10. An electron travelling at $10^6 m/s$ enters parallel in a magnetic field of 1 tesla, the magnetic force acting on it is:
 (A) Zero (B) $10^{-12} N$ (C) $10^3 N$ (D) $1.6 \times 10^{-13} N$
11. When a charged particle is projected opposite to the direction of magnetic field, it experiences a force equal to:
 (A) $quB \cos \theta$ (B) $quB \sin 90^\circ$ (C) quB (D) zero
12. In order to increase the range of voltmeter R_H is:
 (A) increased (B) decreased (C) unchanged (D) increased by 4 times
13. Which device permits the flow of D.C?
 (A) Capacitor (B) Photocell (C) Inductor (D) transformer
14. For an ideal step up transformer:
 (A) $N_p > N_s$ (B) $V_s I_s > V_p I_p$ (C) $V_s < V_p$ (D) $I_s < I_p$
15. When a metal detector comes close to a metal then its frequency:
 (A) becomes double (B) remains same (C) becomes half (D) increases
16. In RLC series circuit, at higher frequencies:
 (A) $X_L = X_C$ (B) $X_L > X_C$ (C) $X_L < X_C$ (D) $X_L = 0$
17. Which one belongs to trivalent group?
 (A) Aluminium (B) Antimony (C) Phosphorous (D) Arsenic

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

(For all sessions)

Physics (Essay Type)

Time: 2:40 Hours

Section - I

Marks: 68

2 x 8 = 16

2- Write short answers of any eight parts from the following.

- Show that Σ and $\frac{\Delta\phi}{\Delta t}$ have the same units.
- What is the effect of current passing through a long straight wire?
- Electric lines of force never cross. Why?
- What is motional emf? State the factors it depends upon.
- What is the back emf effect in motors?
- Why the resistance of ammeter should be very low?
- Why does the picture on T.V screen become distorted when a magnet is brought near the screen?
- Write down the factors upon which the force on current carrying conductor placed in uniform magnetic field depends.
- What is Coulomb's law and effect of dielectric on Coulomb's force?
- State Gauss's law and its mathematical expression.
- Is $\vec{E}$ necessarily zero inside a charged rubber balloon if balloon is spherical? Assume that charge is distributed uniformly over the surface.
- Does the induced emf in a circuit depend on the resistance of the circuit? Does induced current depend on the resistance of the circuit?

2 x 8 = 16

3- Write short answers of any eight parts from the following.

- What are difficulties in testing whether the filament of a lighted bulb obeys ohm's law?
- How heating effect produced when current flow through the conductor?
- What is Thermistor? Give its two applications.
- What is Choke? Why is it used in A.C circuit?
- At what frequency will an inductor of 1.0H have a reactance of 500Ω ?
- How many times per second will an incandescent lamp reach maximum brilliances when connected to a 50Hz source?
- What are ductile and brittle substances? Give an example of each.
- What is meant by hysteresis loss? How is it used in the construction of a transformer?
- What is meant by Dia and Ferromagnetic substances? Give an example for each.
- Write four applications of photo diode.
- Draw the symbol and truth table of NOR gate.
- Why a photo diode is operated in reverse biased state?

2 x 6 = 12

4- Write short answers of any six parts from the following.

- What advantages an electron microscope has over an optical microscope?
- Why do we not observe Compton effect with visible light?
- Define positron and Heisenberg uncertainty principle.
- What do we mean when we say that atom is excited?
- What are the advantages of laser over ordinary light?
- How can radioactivity help in the treatment of cancer?
- What factors make a fusion reaction difficult to achieve?
- What do you mean by the terms critical mass?
- Define Hadrons and Leptons.

Section - II

8x3=24

NOTE: Answer any three questions from the following.

- (a) Define a capacitor and capacitance. Derive an expression for capacitance of a parallel plate capacitor when a dielectric material is inserted between the plates. 05
(b) The resistance of an iron wire at 0°C is $1 \times 10^4 \Omega$. What is the resistance at 500°C , if the temperature co-efficient of resistance of iron is $5.2 \times 10^{-3} \text{K}^{-1}$? 03
- (a) What do you mean by the galvanometer? Write down the principle, construction and working of galvanometer. 05
(b) A square coil of side 16cm has 200 turns and rotates in a uniform magnetic field of magnitude 0.05T. If the peak emf is 12V. What is angular velocity of the coil? 03
- (a) What is RC series circuit? Calculate the impedance and phase angle for RC series circuit. 05
(b) The current flowing into the base of transistor is $100 \mu\text{A}$. Find its collector current I_c and emitter current I_e if the value of current gain β is 100. 03
- (a) What is meant by photo electric effect? Explain it with reference to : (i). Intensity of light. (ii). Frequency of light: Also write and discuss its Important results. 03
(b) What stress would cause a wire into increase in length of 0.01%. If Young's modulus of the wire is $12 \times 10^{10} \text{Pa}$? What force would produce this stress if the diameter of the wire is 0.56mm? 05
- (a) Describe the principle, construction and working of Wilson's cloud chamber. How it provide information about charged particle? 05
(b) Calculate the longest wavelength of radiation for the Paschen Series. 03



Roll No. _____ to be filled in by the candidate.

(session;2014-2016)

Paper Code	4	4	7	5
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Physics (Objective Type)

Time: 20 Minutes

Marks: 17

NOTE: Write answers to the questions on objective answer sheet provided. Four possible answers A,B,C & D to each question are given. Which answer you consider correct, fill the corresponding circle A,B,C or D given in front of each question with Marker or pen ink on the answer sheet provided.

- If the charges are doubled and the distance between them is also doubled, then Coulomb's force will be:
(A) double (B) halved (C) remains same (D) four times
- A rubber ball of radius 2cm has a charge of $5\mu C$ on its surface, which is uniformly distributed, the value of $\vec{E}$ at its centre is:
(A) $10NC^{-1}$ (B) Zero (C) $2.5 NC^{-1}$ (D) $5 \times 10^{-6} NC^{-1}$
- Which one of the following relation is correct?
(A) joule=volt x ampere (B) joule=coulomb / volt (C) joule=volt / ampere (D) joule=coulomb x volt
- In carbon resistors, which colour band indicates the tolerance of $\pm 10\%$?
(A) White (B) Silver (C) Gold (D) Violet
- For an open circuit, terminal potential difference 'Vt' is:
(A) $V_t = 2emf$ (B) $V_t = emf$ (C) $V_t > emf$ (D) $V_t < emf$
- An electron travelling at $10^6 m/s$ enters parallel in a magnetic field of 1 tesla, the magnetic force acting on it is:
(A) Zero (B) $10^{-12} N$ (C) $10^3 N$ (D) $1.6 \times 10^{-13} N$
- When a charged particle is projected opposite to the direction of magnetic field, it experiences a force equal to:
(A) $quB \cos \theta$ (B) $quB \sin 90^\circ$ (C) quB (D) zero
- In order to increase the range of voltmeter R_H is:
(A) increased (B) decreased (C) unchanged (D) increased by 4 times
- Which device permits the flow of D.C?
(A) Capacitor (B) Photocell (C) Inductor (D) transformer
- For an ideal step up transformer:
(A) $N_p > N_s$ (B) $V_s I_s > V_p I_p$ (C) $V_s < V_p$ (D) $I_s < I_p$
- When a metal detector comes close to a metal then its frequency:
(A) becomes double (B) remains same (C) becomes half (D) increases
- In RLC series circuit, at higher frequencies:
(A) $X_L = X_C$ (B) $X_L > X_C$ (C) $X_L < X_C$ (D) $X_L = 0$
- Which one belongs to trivalent group?
(A) Aluminium (B) Antimony (C) Phosphorous (D) Arsenic
- Colour of light emitted by LED depends upon:
(A) its forward biasing (B) its reverse biasing (C) type of material (D) forward current
- At low temperature, a body emits radiations of:
(A) shorter wavelength (B) longer wavelength
(C) high frequency (D) high frequency & shorter wavelength
- The shortest wavelength in Lyman series is equal to:
(A) R_H (B) $\frac{R_H}{2}$ (C) $\frac{1}{R_H}$ (D) $\frac{2}{3} R_H$
- In the reaction, $X + {}^{17}_8O \rightarrow {}^{14}_7N + {}^4_2He$, X is:
(A) 1_1H (B) 2_1H (C) 0_1e (D) ${}^0_{-1}e$

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

(Session; 2014-2016)

Physics (Essay Type)

Time: 3:10 Hours

Section - I

Marks: 83

2- Write short answers of any eight parts from the following.**2 x 8 =16**

- i. Show that Σ and $\frac{\Delta\phi}{\Delta t}$ have the same units.
- ii. What is the effect of current passing through a long straight wire?
- iii. Electric lines of force never cross. Why?
- iv. What is motional emf? State the factors it depends upon.
- v. What is the back emf effect in motors?
- vi. Why the resistance of ammeter should be very low?
- vii. Why does the picture on T.V screen become distorted when a magnet is brought near the screen?
- viii. Write down the factors upon which the force on current carrying conductor placed in uniform magnetic field depends.
- ix. What is Coulomb's law and effect of dielectric on Coulomb's force?
- x. State Gauss's law and its mathematical expression.
- xi. Is $\vec{E}$ necessarily zero inside a charged rubber balloon if balloon is spherical? Assume that charge is distributed uniformly over the surface.
- xii. Does the induced emf in a circuit depend on the resistance of the circuit? Does induced current depend on the resistance of the circuit?

3- Write short answers of any eight parts from the following.**2 x 8 =16**

- i. What are difficulties in testing whether the filament of a lighted bulb obeys ohm's law?
- ii. How heating effect produced when current flows through the conductor?
- iii. What is Thermistor? Give its two applications.
- iv. What is Choke? Why is it used in A.C circuit?
- v. At what frequency will an inductor of 1.0H have a reactance of 500Ω ?
- vi. How many times per second will an incandescent lamp reach maximum brilliances when connected to a 50Hz source?
- vii. What are ductile and brittle substances? Give an example of each.
- ix. What is meant by hysteresis loss? How is it used in the construction of a transformer?
- viii. What is meant by Dia and Ferromagnetic substances? Give an example for each.
- xi. Write four applications of photo diode.
- xii. Draw the symbol and truth table of NOR gate.
- x. Why a photo diode is operated in reverse biased state?

4- Write short answers of any six parts from the following.**2 x 6 =12**

- i. What advantages an electron microscope has over an optical microscope?
- ii. Why do we not observe Compton effect with visible light?
- iii. Define positron and Heisenberg uncertainty principle.
- iv. What do we mean when we say that atom is excited?
- v. What are the advantages of laser over ordinary light?
- vi. How can radioactivity help in the treatment of cancer?
- vii. What factors make a fusion reaction difficult to achieve?
- viii. What do you mean by the terms critical mass?
- ix. Define Hadrons and Leptons.

Section - II

NOTE: Answer any three questions from the following.

8x3=24

5. (a) Define a capacitor and capacitance. Derive an expression for capacitance of a parallel plate capacitor when a dielectric material is inserted between the plates. 05
 (b) The resistance of an iron wire at 0°C is $1 \times 10^4 \Omega$. What is the resistance at 500°C . if the temperature co-efficient of resistance of iron is $5.2 \times 10^{-3} \text{K}^{-1}$? 03
6. (a) What do you mean by the galvanometer? Write down the principle, construction and working of galvanometer. 05
 (b) A square coil of side 16cm has 200 turns and rotates in a uniform magnetic field of magnitude 0.05T. If the peak emf is 12V. What is angular velocity of the coil? 03
7. (a) What is RC series circuit? Calculate the impedance and phase angle for RC series circuit. 05
 (b) The current flowing into the base of transistor is $100 \mu\text{A}$. Find its collector current I_C and emitter current I_E if the value of current gain β is 100. 03
8. (a) What is meant by photo electric effect? Explain it with reference to : (i). Intensity of light.(ii). Frequency of light: 03
 Also write and discuss its Important results.
 (b) What stress would cause a wire into increase in length of 0.01%. If Young's modulus of the wire is $12 \times 10^{10} \text{Pa}$? 05
 What force would produce this stress If the diameter of the wire is 0.56mm?
9. (a) Describe the principle, construction and working of Wilson's cloud chamber. How it provide information about charged particle? 05
 (b) Calculate the longest wavelength of radiation for the Paschen Series. 03

Section -III (Practical)

10.A Answer any four parts from the following.

2x4=08

- (i). Define specific resistance and give its formula.
- (ii). Define potential difference and its unit volt.
- (iii). Write the truth table of AND gate.
- (iv). How can a galvanometer be converted into voltmeter.
- (v). What is photocell?
- (vi). What is the condition for balancing a wheatstone bridge?
- (vii). Define capacitance and its unit Farad.
- (viii). What are forward characteristics of PN junction?

B. Write down the brief procedure to find the resistance of a galvanometer by half deflection method.

03

OR

Write down the brief procedure to study the relation between current and capacitance when different capacitors are used in A.C circuit.

C. Answer the following questions on the basis of graph.

04

- (i). Graph -A: What do you infer from graph?
- (ii). Find the slope of the graph.

OR

- (i). Graph -B: What do you infer from graph?
- (ii). Find the slope of the graph.

710-012-A-

P.T.O

Physics (Objective Type)

(For all Sessions)

Paper Code	8	4	7	7
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Time: 20 Minutes

Group-I

Marks:17

Note: You have four choices for each objective type question as A, B, C and D. The choice which you think is correct, fill that circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling two more circles will result in zero mark in that question. Attempt as many questions as given in objective type question paper and leave others blank.

- The maximum energy of photo-electron depends upon _____.
(A) frequency (B) intensity (C) power (D) illumination
- Compton shift in wavelength is zero when scattering angle of photon is _____.
(A) 30° (B) 60° (C) 0° (D) 90°
- In population inversion, atoms can reside in metastable state for _____.
(A) 10^{-10} sec (B) 10^{-3} sec (C) 10^{-8} sec (D) 10^{-12} sec
- The percentage of original quantity of radioactive material left after five half-lives is nearly _____.
(A) 6% (B) 5% (C) 10% (D) 3%
- Which of the following is used as moderator in nuclear reactor?
(A) heavy water (B) boron (C) cadmium (D) aluminum
- If the distance between charges is halved and each charge is also doubled, then the force between two charges becomes _____ times.
(A) two (B) sixteen (C) eight (D) four
- The force between two charges is 36 N and if the dielectric constant 3.6 value is inserted, then force reduces to _____.
(A) zero (B) 72 N (C) 25 N (D) 10 N
- A thermistor with positive temperature coefficient is heated then its resistance will _____.
(A) decrease (B) increase (C) not be affected (D) become half
- The magnetic force on a neutron in the magnetic field of 10 T is _____.
(A) zero (B) 1.6×10^{-18} N (C) 100 N (D) 1.6×10^{-19} N
- A charge particle cannot be accelerated in _____ field.
(A) electric (B) gravitational (C) magnetic (D) scalar
- The energy stored in the inductor becomes four times if _____.
(A) self-inductance is doubled (B) current is doubled
(C) both inductance and current are doubled (D) current is halved
- Which type of energy is stored in inductor?
(A) electric energy (B) magnetic energy (C) potential energy (D) gravitational energy
- An A.C voltmeter has rms value 220 V, its peak value is _____.
(A) 300 V (B) 210 V (C) zero (D) 311.12 V
- For higher frequency, the inductive reactance will be _____.
(A) high (B) low (C) zero (D) infinite
- At 0 K, semiconductor is _____.
(A) conductor (B) insulator
(C) perfect insulator (D) perfect diamagnetic and paramagnetic
- A PN junction cannot be used as _____.
(A) amplifier (B) capacitor (C) rectifier (D) light emitting diode
- The portion of the transistor with greater concentration is _____.
(A) base (B) collector (C) emitter (D) insulator

Note: Section I is compulsory. Attempt any THREE (3) questions from Section II.

SECTION - I

2. Write short answers to any EIGHT questions.

(2 x 8 = 16)

- Electric lines of force never cross why?
- Prove that $1 \text{ ohm} \times 1 \text{ farad} = 1 \text{ second}$.
- Distinguish between electric field and electric field intensity.
- How can you identify that which plate of a capacitor is positively charged?
- What is the function of the grid in a CRO?
- Why the voltmeter should have a very high resistance?
- How can you make an electronic trajectory visible?
- Why does the picture on a T.V screen become distorted when a magnet is brought near the screen?
- How does radioactivity help in the treatment of cancer?
- Why are heavy nuclei unstable?
- Distinguish between a thermal reactor and a fast reactor.
- Define self-quenching.

3. Write short answers to any EIGHT questions.

(2 x 8 = 16)

- Do bends in a wire affect its electrical resistance? Explain.
- A charge of 9C passes through a conductor in one hour. What is the current in the conductor?
- Define temperature co-efficient of resistivity. Give its unit.
- How many times per second will an incandescent lamp reach maximum brilliance when connected to 50 Hz source?
- What do you mean by phase lag and phase lead?
- Explain the power factor in A.C circuit.
- Write down a note on super conductor.
- Distinguish between intrinsic and extrinsic semi-conductor.
- Define curie temp. What is its value for iron?
- Why ordinary silicon diodes do not emit light?
- Draw the symbol and truth table of NAND gate.
- Why charge carriers are not present in the depletion region?

4. Write short answers to any SIX questions.

(2 x 6 = 12)

- Can an electric motor be used to drive an electric generator with the output from the generator being to operate the motor?
- Does the induced emf always act to decrease the magnetic flux through a circuit?
- Can a step-up transformer increase the power level?
- How would you position a flat loop of wire in a changing magnetic field, so that there is no emf induced in the loop?
- Can pair production take place in vacuum? Explain.
- Photon 'A' has twice the energy of photon 'B' What is the ratio of momentum of 'A' to that of 'B'?
- Will bright light ejected more electrons from metal surface than dimmer light of same colour.
- What do we mean when we say that the atom is excited?
- Is energy conserved when an atom emits a photon of light?

SECTION - II

Note: Attempt any THREE (3) questions from Section II.

- (a) What is capacitor? Derive a relation for the energy density in terms of electric field in the capacitor? (5)
(b) The resistance of an iron wire at 0°C is $1 \times 10^4 \Omega$. What is the resistance at 500°C , if the temperature coefficient of resistance is $5.2 \times 10^{-3} \text{ K}^{-1}$? (3)
- (a) Define motional emf. Derive an expression for motional emf. (5)
(b) A galvanometer having an internal resistance $R_g = 15.0 \Omega$ gives full scale deflection with current $I_g = 20.0 \text{ mA}$. It is to be converted into an ammeter of range 10.0 A. Find the value of shunt resistance R_s . (3)
- (a) What is a transistor? Describe the use of transistor as a amplifier and calculate its voltage gain. (5)
(b) What is the resonance frequency of the circuit, which includes a coil of inductance 2.5 H and a capacitance 40 μF . (3)
- (a) Define strain energy. Derive a relation for strain energy in deformed material? (5)
(b) What is the energy of a photon in a beam of infrared radiation of wavelength 1240 nm? (3)
- (a) State Bohr's model of hydrogen atom. Derive relation for quantized energies for hydrogen atom. (5)
(b) Radiation from a point source obeys the inverse square law. If the count rate at a distance of 1.0 m from Geiger counter is 360 counts per minute. What will be its count rate at 3.0 m from the source? (3)

Physics (Objective Type)

(For all Sessions)

Time: 20 Minutes

Group-II

Marks:17

Note: You have four choices for each objective type question as A, B, C and D. The choice which you think is correct, fill that circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero mark in that question. Attempt as many questions as given in objective type question paper and leave others blank.

- All motions are _____.
(A) absolute (B) uniform (C) relative (D) variable
- If an object moves with the speed of light, its mass will be _____.
(A) zero (B) maximum (C) infinity (D) minimum
- Which of the following has the largest de Broglie wavelength at same speed?
(A) proton (B) α - particles (C) carbon atom (D) electron
- The dead time of G.M tube is _____.
(A) 10^{-3} sec (B) 10^{-6} sec (C) 10^{-4} sec (D) 10^{-8} sec
- Slow neutrons can cause fission in _____.
(A) uranium - 238 (B) uranium - 235 (C) neptunium (D) lithium
- SI unit of electric flux is _____.
(A) $\text{N m}^2 \text{C}^{-1}$ (B) $\text{N m}^2 \text{C}$ (C) $\text{N m}^{-1} \text{C}^{-1}$ (D) NC^{-1}
- A proton is moved from low potential to high potential between two points having potential difference of 1 volt energy gained by proton is _____.
(A) 1 eV (B) 2 eV (C) 1.6×10^{-19} eV (D) 1.6 eV
- A rheostat can be used as _____.
(A) potential divider (B) variable resistance (C) amplifier (D) both (A) & (B)
- Magnetic field due to current carrying straight varies as _____.
(A) $\frac{1}{r^2}$ (B) r^2 (C) $\frac{1}{r}$ (D) r
- Charge to mass ratio of neutron is _____.
(A) zero (B) $9.53 \times 10^9 \text{ C kg}^{-1}$ (C) $1.758 \times 10^4 \text{ C kg}^{-1}$ (D) $1.775 \times 10^{-11} \text{ C kg}^{-1}$
- The motional emf depends upon _____.
(A) length of conductor (B) magnetic field (C) speed (D) all of these
- Lenz's law is the manifestation of conservation of _____.
(A) current (B) voltage (C) energy (D) all of these
- The reactance of an inductor is given as _____.
(A) ωL (B) $\frac{1}{\omega L}$ (C) $\frac{\omega}{L}$ (D) $\frac{L}{\omega}$
- The reactance of an inductor increases with increase in _____.
(A) frequency (B) voltage (C) resistance (D) capacitance
- Which one is not a ductile material?
(A) lead (B) copper (C) steel (D) iron
- Open loop gain of operational amplifier is of the order of _____.
(A) 10^6 (B) 10^3 (C) 10^7 (D) 10^5
- Gain of inverting amplifier with external resistance $R_1 = 10 \text{ k}\Omega$ and $R_2 = 100 \text{ k}\Omega$, is given as _____.
(A) -10 (B) 10 (C) -100 (D) 100

Note: Section I is compulsory. Attempt any THREE (3) questions from Section II.

SECTION - I**2. Write short answers to any EIGHT questions.****(2 x 8 = 16)**

- i. Define electron volt (ev). Show that $1 \text{ ev} = 1.6 \times 10^{-19} \text{ J}$.
- ii. Show that $\frac{1 \text{ volt}}{1 \text{ meter}} = \frac{1 \text{ newton}}{1 \text{ coulomb}}$.
- iii. Is $\vec{E}$ necessarily zero inside a charged rubber balloon, if balloon is spherical? Assume that charge is uniformly distributed over the surface.
- iv. Prove that ohm $\times$ farad = second.
- v. How can a galvanometer is made more sensitive? Explain briefly.
- vi. Suppose that a charge q is moving in a uniform magnetic field with a velocity v . Why is there no work done by magnetic force that acts on charge q ?
- vii. Draw a circuit diagram of current measuring part of avometer.
- viii. Is it possible to orient a current loop in a uniform magnetic field such that the loop will not tend to rotate? Explain.
- ix. What do you understand by back ground radiations? State any two sources of radiation.
- x. How can radioactivity help in the treatment of cancer?
- xi. Differentiate between mass defect and binding energy.
- xii. Define nuclear fission and nuclear fusion.

3. Write short answers to any EIGHT questions.**(2 x 8 = 16)**

- i. Describe a circuit which will give a continuously varying potential.
- ii. A wire of length 10 m has resistance 100Ω . If the wire is stretched to increase its length three times. What will be its new resistance?
- iii. What is meant by an electromotive force (emf)? Give its unit.
- iv. Explain the condition under which electromagnetic waves are produced from a source.
- v. What is meant by phase difference?
- vi. Write four properties of parallel resonance circuit.
- vii. Differentiate between paramagnetic and ferromagnetic substances.
- viii. Define modulus of elasticity. Write down its three kinds.
- ix. Why a photo diode is operated in reverse biased state?
- x. Distinguish between soft magnetic material and hard magnetic material.
- xi. What is solar cell? Give its uses.
- xii. Draw the symbol of pnp and npn transistors six parts.

4. Write short answers to any SIX questions.**(2 x 6 = 12)**

- i. Does the induced emf always act to decrease the magnetic flux through a circuit?
- ii. Can a D.C motor be turned into a D.C generator? What changes are required to be done?
- iii. How fluctuations of the output can be reduced in D.C generator?
- iv. What is meant by efficiency of transformer? Write few steps to improve the efficiency.
- v. Which has the lower energy quanta? Radio waves or x-rays.
- vi. Why don't we observe a Compton effect with visible light?
- vii. Find the mass m of a moving object with speed $0.8 c$.
- viii. Find the speed of electron in the first Bohr orbit.
- ix. Is energy conserved when an atom emits a photon of light?

SECTION - II

Note: Attempt any THREE (3) questions from Section II.

5. (a) Define electric potential. Derive the relation of an electric potential at a point due to point charge. **(5)**
(b) A platinum wire has resistance of 10 ohm at 0°C and 20 ohm at 273°C . Find the value of temperature co-efficient of resistance of platinum. **(3)**
6. (a) What is transformer? How does it work? Explain its use in transmission of electric load to long distances. **(5)**
(b) What current should pass through a solenoid that is 0.5 m long with 10,000 turns of Copper wire so that it will have a magnetic field of 0.4 T ? **(3)**
7. (a) What is comparator circuit? How can it be used as a night switch? **(5)**
(b) A 10 mH, 20Ω coil is connected across 240 v and $\frac{180}{\pi} \text{ Hz}$ source. How much power does it dissipate? **(3)**
8. (a) What is meant by strain energy? How can it be determined from the force extension graph? **(5)**
(b) Assuming you radiate as does a black body at your body temperature about 37°C , at what wavelength do you emit the most energy? **(3)**
9. (a) What is LASER? Describe its working, population inversion and laser action. **(5)**
(b) Find the mass defect and the binding energy for tritium, if the atomic mass of tritium is 3.016049 u . **(3)**