1224 **Warning:- Please write your Roll No. in the space provided and sign. Roll No----------**
(Inter Part – II) (Session 2020-22 to 2022-24) Sig. of Student ----------

Physics (Objective) (Group I) Paper (II)

Time Allowed:- 20 minutes **PAPER CODE 4471** **Maximum Marks:- 17**

SGD-1-24

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. Write **PAPER CODE**, which is printed on this question paper, on the both sides of the Answer Sheet and fill bubbles accordingly, otherwise the student will be responsible for the situation. Use of Ink Remover or white correcting fluid is not allowed.

Q. 1

1) The capacitance of a charged capacitor is 'c' and energy stored on the account of charge is U then quantity of charge on the capacitor will be

(A) Zero (B) $Q = CV$ (C) $Q = \sqrt{2UC}$ (D) $Q = \sqrt{\frac{UC}{2}}$

2) If 4×10^{20} ev of energy is required to move a charge of 1C between two points then potential difference between the point is

(A) 4×10^{20} v (B) 64×10^{19} v (C) 64×10^{18} v (D) 64 v

3) A car battery has emf 12 v and internal resistance $5\times10^{-2}\ \Omega$, if it draws 60 A current, the terminal voltage of battery will be

(A) 3 V (B) 5 V (C) 9 V (D) 12 V

4) The resistance of the coil of ammeter is R the shunt required to increase its range n times should have a resistance

(A) R/n+1 (B) R/n-1 (C) nR (D) R/n

5) When electron moves through a magnetic field, then change occurs in

(A) Speed (B) Direction (C) Energy (D) Mass

6) The emf linked with same coil when the rate of change of current in the coil is unity is equal to

(A) Self induction (B) Mutual Induction (C) Self inductance (D) Mutual inductance

7) A coil having 500 square 100 ps, each of side 10 cm is placed normal to the magnetic field which is increasing at the rate of 0.1 tesla per second. The induced emf is

(A) 0.1 v (B) 0.5 v (C) 1 v (D) 5 v

8) During frequency modulation when amplitude of signal is zero, the frequency of the carrier wave is

(A) Normal (B) Zero (C) Minimum (D) Maximum

9) In RC series circuit voltage drops across resistor is 30 v and across capacitor is 40 v then the applied voltage must be

(A) 70 v (B) 10 v (C) 50 v (D) 120 v

10) A Force F is needed to break a copper wire having radius R. The force needed to break a copper wire of same length and radius 2R will be

(A) F/2 (B) 2F (C) 4F (D) F/4

11) In common emitter transistor amplifier the input signal and output signal are always

(A) Have same magnitude (B) Have same phase (C) Negative (D) Out of phase by 180°

12) The term inverter is used for

(A) NOR gate (B) NAND gate (C) NOT gate (D) All gates

13) A proton and α-particle are accelerated through same voltages the ratio of their de-Broglie wavelength will be

(A) 1 : 2 (B) $2\sqrt{2}:1$ (C) $\sqrt{2}:1$ (D) 2 : 1

14) When a photon collide with an electron which of the following of photon increases

(A) Wavelength (B) Energy (C) Frequency (D) All of these

15) The ratio of the longest and shortest wavelength of the Lyman series is approximately

(A) 4/3 (B) 9/4 (C) 9/5 (D) 16/7

16) The SI unit of radiation dose is

(A) Rem (B) Gray (C) Becquerel (D) Roentgen

17) Leptons are particles that do not experience

(A) Strong nuclear force (B) Electric force (C) Weak nuclear force (D) Magnetic force

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Physics (Subjective) (Group I) (Session 2020-22 to 2022-24) (Inter Part - II) Paper (II)

Time Allowed: 2.40 hours SGD-1-24 **Section --------- I** **Maximum Marks: 68**

2. Answer briefly any Eight parts from the followings:- **8 × 2 = 16**

(i) What is RC time constant. Prove that unit of RC is second. (ii) Define potential gradient. Give its direction and units.

(iii) 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?

(iv) Is E necessarily zero inside a charged rubber balloon if balloon is spherical? Assume that charge is distributed uniformly over the surface. (v) Define current sensitivity of a galvanometer.

(vi) Why is there no work done by the magnetic force that acts on the charge.

(vii) If a charged particle moves in a straight line through some region of space, can you say that magnetic field in this region is zero?

(viii) Why the resistance of an ammeter should be very low. (ix) What is the function of cadmium rods in a nuclear reactor.

(x) What is meant by dead time for G.M. counter. Give its value for G.M. tube.

(xi) How can radioactivity help in the treatment of cancer?

(xii) What is a radioactive tracer? Describe one application each in medicine, agriculture and industory.

3. Answer briefly any Eight parts from the followings:- **8 × 2 = 16**

(i) Is the filament resistance lower or higher in a 500 W, 220 V light bulb than in a 100 W, 220 V bulb?

(ii) In a R – L circuit , will the current Lag or Lead the voltage? Illustrate you answer by a vector diagram.

(iii) Draw a stress strain curve for ductile material and define yield point.

(iv) How does the motion of an electron in a n-type substance differ from the motion of holes in a p-type substance?

(v) What is drift velocity? Give its value. (vi) What is the phenomenon of electroplating.

(vii) Give two uses of three phase A.C supply. (viii) What is phase of A.C? How you express it by vector diagram.

(ix) Differentiate between unit cell and crystal lattice. (x) Differentiate between elasticity and plasticity of a material.

(xi) What is normal operation of transistor? Show by diagram. (xii) Can a transistor work as a switch? Explain.

4. Answer briefly any Six parts from the followings:- **6 × 2 = 12**

(i) In a certain region the earth's magnetic field points vertically down. When a plane flies due north, Which wingtip is positively charged?

(ii) Does the induce emf always act to decrease the magnetic flux through a circuit?

(iii) Name the factors upon which the self inductance depends.

(iv) Does the brightness of a beam of light primarily depends on the frequency of photons or on the number of photons?

(v) What advantages an electron microscope has over an optical microscope?

(vi) Define stopping potential and threshold frequency in photoelectric effect.

(vii) Show that Compton shift is equal to Compton wavelength at an angle of 90°.

(viii) Is energy conserved when an atom emits a photon of light? (ix) Differentiate between K_α X – rays and K_β X – rays.

Note: Attempt any three questions. **Section ---------- II** **(8 × 3 = 24)**

5. (a) State Gauss's Law. Calculate the electric intensity due to an infinite sheet of charge.

(b) The potential difference between the terminals of a battery in open circuit is 2.2 V, when it is connected across a resistance of 5.0 Ω, the potential falls to 1.8 V. Calculate the current and the internal resistance of the battery.

6. (a) What is transformer? Describe its principle, construction and working in detail.

(b) The resistance of a galvanometer is 50.0 Ω and reads full scale deflection with a current of 2.0 mA. Show by a diagram how to convert this galvanometer into voltmeter reading 200 V full scale

7. (a) How can we use comparator as a Night Switch? Explain with the help of diagram.

(b) A 10 mH, 20 Ω coil is connected across 240 V and $\frac{180}{\pi}$ Hz source. How much power does it dissipate?

8. (a) Write a note on Compton effect.

(b) A 1.0 m long copper wire is subjected to a stretching force and its length increases by 20 cm. Calculate the tensile strain and the percent elongation which the wire undergoes.

9. (a) What is He – Ne Laser? Explain. Also write uses of laser in medicine and industry.

(b) A 75 Kg person receives a whole body radiation dose of 24 m-rad, delivered by α – particles for which RBE factor is 12. Calculate (i)absorbed energy in Joules (ii)Equivalent dose in rem

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(Inter Part – II) **(Session 2020-22 to 2022-24)** Sig. of Student ----------

Physics (Objective) SGD-2-24 **(Group II)** **Paper (II)**

Time Allowed:- 20 minutes **PAPER CODE 4472** **Maximum 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. Write **PAPER CODE**, which is printed on this question paper, on the both sides of the Answer Sheet and fill bubbles accordingly, otherwise the student will be responsible for the situation. Use of Ink Remover or white correcting fluid is not allowed.

Q. 1

1) If the distance between two point charge is halved, the electric intensity becomes
(A) Half (B) $\frac{1}{4}$ times (C) Double (D) 4 times

2) Current which flows from high potential to low potential is
(A) Electric current (B) Conventional current (C) Eddy current (D) Remain constant

3) The value of permeability of free space is
(A) $4\pi\times10^{-9}WbA^{-1}m^{-1}$ (B) $4\pi\times10^{-7}WbA^{-1}m^{-1}$ (C) $4\pi\times10^{-10}WbA^{-1}m^{-1}$ (D) $4\pi\times10^{7}WbA^{-1}m^{-1}$

4) Lenz's law applies on
(A) Magnitude of emf (B) Direction of emf (C) Direction of induced current (D) Resistance

5) The mean value of A.C in a cycle is
(A) 1 (B) 0 (C) I_o (D) $\frac{I_o}{\sqrt{2}}$

6) Which one is a ductile substance.
(A) Glass (B) Wood (C) Lead (D) Oxygen

7) Reverse current flows due to
(A) Majority charge carrier (B) Minority charge carrier (C) Electrons (D) Holes

8) Earth orbital speed is
(A) 10 km/s (B) 20 km/s (C) 30 km/s (D) 40 km/s

9) Which of the series of hydrogen atom lies in ultraviolet region
(A) Laymen series (B) Balmer series (C) Paschen series (D) Bracket series

10) The binding energy per nucleon is maximum for
(A) Helium (B) Iron (C) Polonium (D) Radium

11) Which one is photo conductor
(A) Copper (B) Selenium (C) Mercury (D) Aluminium

12) If the length and turns of a solenoid is doubled, strength of magnetic field will be
(A) Doubled (B) Half (C) Constant (D) Four times

13) Energy stored in inductor is
(A) $\frac{1}{2}LI^2$ (B) $\frac{1}{2}LI$ (C) $\frac{1}{2}L^2I$ (D) $\frac{1}{2}L^2I^2$

14) In case of A.C through resistor, voltage and current are
(A) 0° (B) 90° (C) 180° (D) 270°

15) A diode characteristic curve is plotted between
(A) Current and Resistance (B) Voltage and Time (C) Voltage and current (D) Current and Time

16) At low temperature, Body emitts radiation of
(A) Short wavelength (B) Long wavelength (C) High frequency (D) Both (A) and (C)

17) Which one is not affected by Electric and magnetic field.
(A) β – rays (B) γ – rays (C) α – rays (D) Electrons

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Physics (Subjective) Group (II) (Session 2020-22 to 2022-24) Paper (II)

Time Allowed: 2.40 hours Section ---------- I (Inter Part - II) Maximum Marks: 68

2. Answer briefly any Eight parts from the followings:- SGD-2-248 **× 2 = 16**

(i) How can you identify that which plate of a capacitor is positively charged?

(ii) Electric lines of force never cross. Why? **(iii)** State Coulomb's law. Also write its mathematical form.

(iv) Write down at least two properties of electric field lines.

(v) Suppose that a charge 'q' is moving in a uniform magnetic field with a velocity v. Why is there no work done by the magnetic force that acts on the charge q?

(vi) Why does the picture on a T.V screen become distorted when a magnet is brought near the screen?

(vii) Define right hand rule for determining the direction of magnetic field in a current carrying conductor.

(viii) Find the value of the magnetic field that will cause a maximum force of 2.0×10^{-3} N on a 10 cm straight wire carrying a current of 5A.

(ix) Why are heavy nuclei unstable? **(x)** What factor make a fusion reaction difficult to achieve.

(xi) Define mass defect and binding energy. Also write their mathematical expressions.

(xii) Show that 1u = 931 MeV by using the relation $E = mc^2$.

3. Answer briefly any Eight parts from the followings:- 8 × 2 = 16

(i) Do bends in a wire effect its electrical resistance? Explain.

(ii) Why heat is produced in a conductor due to flow of current.

(iii) What are the difficulties in testing whether the filament of a lighted bulb obeys ohm's Law?

(iv) A sinusoidal current has rms value of 20 A. What is the maximum or peak value?

(v) How many times per minutes will be an incandescent Lamp reach maximum brilliance when connected to 50 Hz Source.

(vi) What is power factor in an A.C circuit? Explain. **(vii)** Define stress and strain. What are their SI units?

(viii) Define modulus of elasticity. Show that the units of modulus of elasticity and stress are the same.

(ix) What is squids and where it is used? **(x)** Define the current gain of a Transistor. Give Mathematical expression.

(xi) Why a photo diode is operated in reverse biased state?

(xii) How does the motion of an electron in a n-type substance differ from the motion of holes in p-type substance?

4. Answer briefly any Six parts from the followings:- 6 × 2 = 12

(i) In transformer, output power is less than input power. Why? Explain.

(ii) Can an electric motor be used to drive an electric generator with the output from the generator being used to operate the motor?

(iii) Does the induced emf always act to decrease the magnetic flux through a circuit?

(iv) What is frame of reference? Also differentiate between inertial and non-inertial frames of reference.

(v) Write the postulates upon which special theory of relativity is based.

(vi) Will higher frequency light eject greater number of electrons than low frequency light?

(vii) Is it possible to create a single electron from energy? Explain.

(viii) State two postulates of Bohr's model of the Hydrogen atom.

(ix) What are the advantages of lasers over ordinary light?

Note: Attempt any three questions. Section ---------- II (8 × 3 = 24)

5. (a) Derive the expressions for electrical power and power dissipated in resistors.

(b) Two point charges, $q_1 = -1.0\times10^{-6}C$ and $q_2 = +4.0\times10^{-6}C$, are separated by a distance of 3.0 m. Find and justify the zero – field location.

6. (a) Derive an expression of force acting on a moving charge in a magnetic field.

(b) An ideal step down transformer is connected to main supply of 240 V. It is desired to operate a 12 V, 30 W lamp. Find the current in the primary and the transformation ratio.

7. (a) What is transistor? How can we use it as an amplifier. Find an expression for gain of an amplifier.

(b) A circuit has an inductance of $\frac{1}{\pi}H$ and resistance of 2000 Ω. A 50 Hz A.C is supplied to it. Calculate the reactance and impedance offered by the circuit.

8. (a) Define photoelectric effect? Discuss it when the intensity of incident light remain constant.

(b) A 1.5 cm diameter cylinder is subjected to a load of 2500 kg. Calculate the stress on the bar in mega pascals.

(a) Explain the term mass defect and binding energy with an example.

(b) Compute the shortest wavelength radiation in the Balmer series? What value of n must be used?

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(Inter Part – II) (Session 2019-21 to 2021-23) Sig. of Student ----------

Physics (Objective) (Group I) SGD-12-1-23 Paper (II)

Time Allowed:- 20 minutes **PAPER CODE 4475** Maximum 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. Write **PAPER CODE**, which is printed on this question paper, on the both sides of the Answer Sheet and fill bubbles accordingly, otherwise the student will be responsible for the situation. Use of Ink Remover or white correcting fluid is not allowed.

Q. 1

1) A spectrum of radiation is which the quantity being studied, such as frequency or energy takes discrete value is called _____ spectra.
(A) Band (B) None (C) Continuous (D) Discrete

2) The particles greater in mass that protons are called
(A) Mesons (B) Baryons (C) Bosons (D) Nucleons

3) Moderator in fission process slow down the fast neutrons and make it easy to produce fission is
(A) Uranium-235 (B) Thorium-223 (C) Natural Uranium (D) Uranium 239

4) Two opposite point charge of same magnitude separated by distance "2d", electric potential midway between them is.
(A) 1 V (B) 2 V (C) Zero (D) V/2

5) Electron volt (eV) is the unit of.
(A) Potential (B) Electric field (C) Energy (D) Charge

6) The SI unit of temperature co-efficient of resistivity is
(A) C^{o-1} (B) F^{o-1} (C) $K^{-1}m$ (D) K^{-1}

7) A galvanometer can be made sensitve by.
(A) Using a small and thick suspension (B) Decreasing the area of coil (C) Increasing the magnetic field (D) Decreasing the turns of coil

(A) Circular (B) Spiral (C) Helix (D) Ellipse

9) The principle of an electric generator is based on.
(A) Coulomb's Law (B) Faraday's Law of Electro magnetic Induction (C) Ampere's Law (D) Lenz's Law

10) The SI unit of mutual induction is
(A) $Vs^{-1}A^{-1}$ (B) VsA^{-1} (C) Henry (D) Both (B) & (C)

11) An expression for capacitive reactance is given by.
(A) $X_c = \frac{1}{2\pi fC}$ (B) $X_c = \frac{1}{2\pi f}$ (C) $X_c = 2\pi fC$ (D) $X_c = 2\pi fL$

12) At what frequency will an inductor of 1.0 H have a reactance of 500 Ω ?
(A) 90 Hz (B) 100 Hz (C) 80 Hz (D) 110 Hz

13) The electrical resistance of mercury disappears suddenly as the temperature is reduced
(A) Above 4.2 K (B) Below 4.2 K (C) To 4.2 K (D) 7.1 K

14) In P-type material, the majority charge carriers are
(A) Electrons (B) Protons (C) No charge (D) Holes

15) The output of two input OR Gate is "0" only when its.
(A) Both inputs are "0" (B) Either input is "1" (C) Both input are "1" (D) Either input is "0"

16) The mass "m" of a moving object with speed 0.8c is.
(A) 0.66 m_o (B) 0.97 m_o (C) 1.67 m_o (D) 1.08 m_o

17) In compton effect the wavelength of Scattered $X-rays$ is__ than the wavelength of incident $X-rays$.
(A) Smaller (B) Larger (C) Same order (D) All of these

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SGD-12-1223

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Physics (Subjective) (Group I) (Session 2019-21 to 2021-23) (Inter Part - II) Paper (II)

Time Allowed: 2.40 hours **Section ---------- I** **Maximum Marks: 68**

2. Answer briefly any Eight parts from the followings:- **8 × 2 = 16**

(i) How can you identify that which plate of a capacitor is positively charged.
(ii) Electric lines of force never cross. Why? **(iii)** Write down the properties of electric field lines.
(iv) How can we find the dielectric constant of a material using a capacitor.
(v) If a charged particle moves in a straight line through some region of space, can we say that the magnetic in the region is zero. **(vi)** Why does the picture on a TV screen becomes distorted when a magnet is brought near the screen.
(vii) What is meant by Lorentz force. Give its equation.
(viii) $\vec{B} = 40\hat{i} - 18\hat{k}$. How much flux passes through 5 cm² area of loop in xy-plane.
(ix) What are isotopes? What do they have common and what are their differences.
(x) How radioactivity can help in treatment of cancer? **(xi)** What does a mass-spectrograph do.
(xii) Explain the process of α -decay with an example

3. Answer briefly any Eight parts from the followings:- **8 × 2 = 16**

(i) Write uses of rheostat? **(ii)** Do bends in a wire affect its electrical resistance? Explain.
(iii) Why does the resistance of a conductor rise with temperature?
(iv) At what frequency will an inductor of 1.0 H have a reactance of 500 Ω?
(v) How does doubling the frequency affect the reactance of **(a)** an inductor **(b)** a capacitor.
(vi) In a R-L circuit, will the current lag or lead the voltage? Illustrate your answer by a vector diagram.
(vii) Differentiate between glassy solids and polymeric solids.
(viii) Write any two properties of an insulator.
(ix) What is meant by para and ferromagnetic substances. Give examples for each.
(x) In a certain circuit, the transistor has a collector current of 10 mA and a base current of 40 μA. What is the current gain of the transistor?
(xi) Why charge carriers are not present in the depletion region? **(xii)** why ordinary silicon diodes do not emit light?

4. Answer briefly any Six parts from the followings:- **6 × 2 = 12**

(i) How the efficiency of a transformer can be unproved. **(ii)** What is the annihilation of matter.
(iii) Four un marked wires emerges from a transformer. What steps should be taken to determine the turn ratio.
(iv) In a certain region, the earth's magnetic points vertically down. When a plane flies due north which wing tip is positively charged.
(v) Why we do not notice the de-broglie wavelength for a pitched cricket ball.
(vi) What happens to the total radiations from black body if its absolute temperature is doubled.
(vii) What advantages an electron microscope has over an optical microscope.**(viii)**Give two uses of Laser.
(ix) Explain why laser operation can not occur without population in version between two atomic levels.

Note: Attempt any three questions. **Section ---------- II** **(8 × 3 = 24)**

5. **(a)** Define conventional current. How current passes through a metallic conductor. Also explain drift velocity of electrons in a metal.
(b) Determine the electric field at the position $\vec{r} = (4\hat{i} + 3\hat{j})m$ caused by a point charge $q = 5.0 \times 10^{-6} C$ placed at origin.

6. **(a)** Define and explain mutual induction. Also derive relation for mutual induction.
(b) How fast must a proton move in a magnetic field of 2.50×10^{-3} T such that the magnetic force is equal to its weight?

7. **(a)** What is operational amplifier? How operational amplifier as a comparator, act as a "Night Switch".
(b) A circuit has an inductance of $\frac{1}{\pi} H$ and resistance of 2000 Ω. A 50 Hz A.C is supplied to it. Calculate the reactance and impedence offered by the circuit.

8. **(a)** What is energy band theory? How does this theory explain diverse electric behaviour of solids?
(b) X-rays of wavelength 22 pm are scattered from a carbon target. The scattered radiations being viewed at 85° to the incident beam. What is Compton shift?

9. **(a)** What is mass spectrograph? Describe an experimental arrangement of a spectrograph and derive the relation showing mass and B^2 as in linear relation.
(b) Calculate the longest wavelength of radiation for the Paschen series.

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(Inter Part – II) **(Session 2019-21 to 2021-23)** **Sig. of Student ----------**

Physics (Objective) SGD-12-2-23 **(Group II)** **Paper (II)**

Time Allowed:- 20 minutes **PAPER CODE 4476** **Maximum 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. Write **PAPER CODE**, which is printed on this question paper, on the both sides of the Answer Sheet and fill bubbles accordingly, otherwise the student will be responsible for the situation. Use of Ink Remover or white correcting fluid is not allowed.

Q. 1

1) Isotopes of Xenon are
(A) 12 (B) 24 (C) 36 (D) 37

2) Binding energy per nucleon is maximum for
(A) Uranium (B) Gold (C) Silver (D) Iron

3) The value of relative permitivity of air is close to
(A) Vacuum (B) Paraffined paper (C) Teflon (D) Transformer oil

4) The electric flux through any close surface is depending on
(A) Shape of close surface (B) Medium (C) Size of close surface (D) Location of charge

5) Thermo-couples convert heat energy into
(A) Wind energy (B) Potential energy (C) Nuclear energy (D) Electrical energy

6) The value of permitivity of free space is
(A) $4\pi \times 10^{-7} WbA^{-1}m^{-1}$ (B) $\pi \times 10^{-7} WbA^{-1}m^{-1}$ (C) $2\pi \times 10^{-7} WbA^{-1}m^{-1}$ (D) $2\pi r \times 10^{-7} WbA^{-1}m^{-1}$

7) The magnetic field inside the current carrying long solenoid is
(A) Strong (B) Weak (C) Zero (D) Uniform

(A) Maximum (B) Zero (C) Minimum (D) 3V

9) Lenz's law is called as the law of conservation of
(A) Charge (B) Parity (C) Momentum (D) Energy

10) Direct current cannot pass through
(A) Inductor (B) Resistor (C) Chock (D) Capacitor

11) The expression for inductive reactance is
(A) ωL (B) $\frac{2\pi L}{f}$ (C) $\frac{1}{\omega L}$ (D) TL

12) The critical temperature of mercury is .
(A) 1.18 K (B) 4.2 K (C) 3.72 K (D) 7.2 K

13) Actual movement across the diode Junction is due to
(A) Holes (B) Ions (C) Protons (D) Electrons

14) At the junction of diode, where no charge carrier is present is called
(A) Active region (B) Depletion region (C) Saturated region (D) Forbidden region

15) Which one explain particle nature of light
(A) Interference (B) Diffraction (C) Polarization (D) Photoelectric effect

16) Who gave the idea of matter waves
(A) Einslein (B) Huygen (C) De-Broglie (D) Newton

17) Electron cannot be resided in the nucleus, it can be proved by
(A) Photoelectric effect (B) Pair production (C) Uncertainty principle (D) De-Broglie Hypothesis

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Physics (Subjective) Group (II) (Session 2019-21 to 2021-23) Paper (II)

Time Allowed: 2.40 hours Section ---------- I (Inter Part - II) Maximum Marks: 68

2. Answer briefly any Eight parts from the followings:- SGD-12-2-238 $8 \times 2 = 16$

(i) Write similarity and differences between electrostatic and gravitational forces?

(ii) Verify that an ohm times farad is equivalent to second? **(iii)** Electric lines of forces never cross. Why?

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

(v) Why the resistance of an ammeter should be very low?

(vi) Why does the picture on a TV screen become distorted when a magnet is brought near the screen?

(vii) Draw saw tooth voltage wave form and describe it? **(viii)** Write uses of CRO?

(ix) Write the names of hydrogen isotopes with their symbols?

(x) Why moderators are used in the core of nuclear reactor?

(xi) Why are heavy nuclei unstable? **(xii)** A particle which produces more ionization is less penetrating?

3. Answer briefly any Eight parts from the followings:- $8 \times 2 = 16$

(i) Do bends in a wire affects its electrical resistance? Explain.

(ii) On what factors chemical effect of current depends?

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

(iv) How many times per second will an incandescent lamp reach a maximum brilliance when connected to a 50 Hz source?

(v) What is Amplitude Modulation and Frequency Modulation?

(vi) How the reception of a particular radio station is selected on your radio set?

(vii) What is meant by hysteresis loss? How it is used in the construction of a transformer?

(viii) Distinguish between Elasticity and plasticity of a body.

(ix) Discuss the mechanism of electrical conduction by "Holes" and "Electrons" in a pure semiconductor elements.

(x) Why is the base current in a transistor is very small?

(xi) Draw the circuit diagram for "Half wave" and "Full wave" rectification.

(xii) Why ordinary silicon diodes donot emit light?

4. Answer briefly any Six parts from the followings:- $6 \times 2 = 12$

(i) What is back emf effect in motors? (ii) What are advantages of lasers over ordinary light.

(iii) Can a DC motor be turned in a DC generator? What changes are required?

(iv) Does induced emf in a circuit depend on the resistance of the circuit? Explain.

(v) Which has the lower energy quanta? Radiowaves or X-rays. (vi) Can pair production take place in vacuum? Explain.

(vii) Draw block diagram of electron microscope. Write any one of its advantage.

(viii) What is planck's assumption to explain black body radiations?

(ix) What is a spectral series? Name any one spectral series of hydrogen with its relation.

Note: Attempt any three questions. Section ---------- II **$(8 \times 3 = 24)$**

5. (a) Derive the equation of a balanced wheatstone Bridge with diagram.

(b) A particle having a charge of 20 electrons on it falls through a potential difference of 100 volts. Calculate the energy acquired by it in electron-volts (eV).

6. (a) Find the relation of force on a moving charge in a constant magnetic field. Also find its direction.

(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 1.0 S. Find the induced emf in the coil as it is pulled out of the field.

7. (a) Explain the RLC series resonance circuit. Derive the relation for resonance frequency. Also discuss the properties of series resonance circuit?

(b) In a certain circuit the transistor has collector current of 10 mA and base current is 40 μ A. What is the current gain of transistor?

8. (a) Define and explain uncertainty principle.

(b) A wire 2.5m long and cross-sectional area $10^{-5}\ m^2$ is stretched 1.5 mm by a force of 100N in the elastic region. Calculate. **(i)** the strain. **(ii)** Young's modulus. **(iii)** The energy stored in the wire.

9. (a) What is solid state detector? Explain its principle, construction and working.

(b) An electron jumps from a level $E_i = -3.5 \times 10^{-19}\ J$ to $E_f = -1.20 \times 10^{-19} J$ What is the wavelength of the emitted light.

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(Inter Part – II) **(Session 2018-20 to 2020-22)** **Sig. of Student ----------**

Physics (Objective) **(Group II) SAO 42-22** **Paper (II)**

Time Allowed:- 20 minutes **PAPER CODE 4478** **Maximum 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. Write **PAPER CODE**, which is printed on this question paper, on the both sides of the Answer Sheet and fill bubbles accordingly, otherwise the student will be responsible for the situation. Use of Ink Remover or white correcting fluid is not allowed.

Q. 1

1) Production of X-rays is the reverse process of
(A) Photoelectric effect (B) Compton effect (C) Inhalation (D) Pair Production

2) The Binding energy for Helium is given by
(A) 30.2 MeV (B) 2.25 MeV (C) 2.28 MeV (D) 28.2 MeV

3) After two half-lives the number of decayed nuclei of an element are
(A) N/4 (B) N/2 (C) 3N/4 (D) N

4) Photo copier and injek printer are the application of :
(A) Magnetism (B) Electricity (C) Electro magnetism (D) Electro static

5) SI unit of electric flux is:
(A) $Nm^2 c^{-1}$ (B) Nmc^{-1} (C) $Nm^{-1} c^{-1}$ (D) $Nm^3 c^{-2}$

6) When the internal resistance of source is equal to the load maximum power dissipated is
(A) $E/4r$ (B) $E/4r^2$ (C) $E^2/4r$ (D) $E^2/4r^2$

7) Unit of magnetic flux density is
(A) wb m^{-2} (B) N A^{-1} m^{-1} (C) Tesla (D) All of above

8) When a charge is projected perpendicular to uniform magnetic field its path is:
(A) Spiral (B) Circular (C) Helix (D) Ellipse

9) If the angular frequency of A.C Generator increased to double, the time period would become
(A) Half (B) Double (C) 4 Times (D) $\frac{1}{4}$ Times

10) "Eddy current" are set up in a direction:
(A) parallel to flux (B) anti parallel to flux (C) at 45° to flux (D) perpendicular to the flux

11) When effective value of current is 10. What is its peak value?
(A) 10 (B) 14.2 (C) 12 (D) 13

12) Which are the Substance called _____ which undergo plastic deformation until they break.
(A) Brittle (B) Ductile (C) Amorphous (D) Polymeric

13) Choke consumes extremly small.
(A) Current (B) Charge (C) Power (D) Potential

14) The size of base in a transistor is
(A) 10^{-6} m (B) 10^{-8} m (C) 10^{-7} m (D) 10 m

15) _____ is the building block of every complex electronic circuit.
(A) Resistor (B) Capacitor (C) Amplifier (D) Diode

16) The unit of work function is
(A) volt (B) joule (C) watt (D) Farad

17) Compton's Shift will be maximum at the angle of
(A) 90° (B) 360° (C) 180° (D) 60°

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Physics (Subjective) **Group (II)** (Session 2018-20 to 2020-22) **Paper (II)**

Time Allowed: 2.40 hours **Section ---------- I** (Inter Part - II) Maximum Marks: 68

2. Answer briefly any Eight parts from the followings:- SGD-92-228 **× 2 = 16**

(i) How the capacitance is increased by placing a dielectric b/w the plates of a capacitor?

(ii) Prove that time constant is equal to R×C, where R is resistance and 'C' is capacitance.

(iii) Calculate the force b/w two similar charges of unit magnitude placed 1 meter apart in air.

(iv) The potential is constant throughout a given region of space. Is the electric field zero or non-zero in this region? Explain.

(v) Can an electron at rest be set in motion by bringing a magnet close to that electron? Explain.

(vi) A current in a conductor produces a magnetic field, which can be calculated using Ampere's Law. Since current is defined as the rate of flow of charge, what can you conclude about the magnetic field due to stationary charges? What about moving charges.

(vii) How can a current loop be used to determine the presence of a magnetic field in a given region of space.

(viii) Why the resistance of an ammeter should be very low?

(ix) Mass defect for helium is 0.03034u. Calculate its binding energy in (eV).

(x) What fraction of a radioactive sample decays after two half lives have elapsed?

(xi) Describe the interaction of beta radiations with matter.

(xii) A particle which produces more ionization is less penetrating. why?

3. Answer briefly any Eight parts from the followings:- **8 × 2 = 16**

(i) Define thermistors. Write its one application.

(ii) Starting from left a carbon resistance has colour bands in the order Red, violet, orange and silver. Calculate the value of resistance with tolerance.

(iii) Do bends in a wire affect its electrical resistance? **(iv)** Define Choke.

(v) How many times per second will an incandescent lamp reach maximum brilliance when connected to a 50 Hz source?

(vi) How does doubling the frequency affect the reactance of (a) an inductor (b) a capacitor

(vii) What is meant by paramagnetic and diamagnetic substances. Give examples for each.

(viii) On the basis of energy band theory distinguish between insulators and conductors.

(ix) Define retantivity and Coercivity. **(x)** What is Photodiode? Write down its two applications.

(xi) Write down the Truth table and symbol of NAND gate.

(xii) Why Photo diode is operated in reverse biased state?

4. Answer briefly any Six parts from the followings:- **6 × 2 = 12**

(i) Show that ε and $\frac{\Delta\phi}{\Delta t}$ have the same units.

(ii) How would you position a Flat loop of wire in a changing magnetic Field so that there is no emf induced in the loop?

(iii) What are the dimensions of mutual Inductance? **(iv)** State Faraday's Law. Write its Mathematical expression

(v) Which Photon, red, green or blue carries the most: (a) energy (b) momentum

(vi) Why can red light be used in a photographic dark room when developing Films, but not blue or white light?

(vii) Define Photoelectric effect and Pair Production. **(viii)** What are the advantages of lasers over ordinary light?

(ix) What is biological effects of X-rays?

Note: Attempt any three questions. **Section ---------- II** **(8 × 3 = 24)**

5. (a) What is potentiometer? How it can be used as, (i) Potential divider (ii) Measuring of emf of a cell.

(b) Two point charges $q_1 = -1.0\times10^{-6}C$ and $q_2 = 4.0\times10^{-6}C$, are separated by a distance of 3.0 m. Find and justify the zero-field location?

6. (a) Describe the method to determine the e/m of an electron.

(b) A circular coil has 15 turns of radius 2cm each. The plane of the coil lies at 40° to a uniform magnetic field of 0.2 T. If the field is increase by 0.5 T in 0.2 s. Find Magnitude of the Induce emf.

7. (a) What is the band theory of solids. Differentiate between insulator, conductor and semiconductor on the basis of this theory.

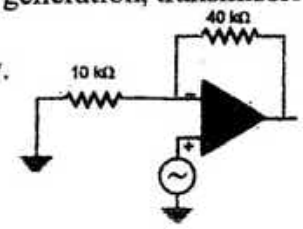
(b) A 50 keV photon is Compton scattered by a quasi-free electron. If the scattering angle of photon is 45°, what is its wavelength of the scattering.

8. (a) Describe the production of X-rays. Write down the use of X-rays to visualize the fractured bones and defects in structural steel.

(b) The half life of $^{91}_{33}Sr$ is 9.70 hours. Find the decay constant.

9. (a) What are electromagnetic waves. How can you explain principle of generation, transmission and reception of electromagnetic waves.

(b) Calculate the gain of non-Inverting amplifier shown in figure below.



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(Inter Part – II) (Session 2018-20 to 2020-22) Sig. of Student ----------

Physics (Objective) **(Group I)** SGD-G1-22 **Paper (II)**

Time Allowed:- 20 minutes **PAPER CODE 4471** Maximum 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. Write **PAPER CODE**, which is printed on this question paper, on the both sides of the Answer Sheet and fill bubbles accordingly, otherwise the student will be responsible for the situation. Use of Ink Remover or white correcting fluid is not allowed.

Q. 1

1) A rubber ball of radius 2 cm has a charge of 5 μc on its surface, which is uniformly distributed. The value of E at its Centre is
(A) 10 NC^{-1} (B) Zero (C) 2.5 NC^{-1} (D) 5×10^{-6} NC^{-1}

2) The minimum value of charge on free particle is
(A) $\frac{2}{3}e$ (B) $\frac{1}{3}e$ (C) $\frac{-2}{3}e$ (D) e

3) During danger the 'eel' turn itself into a living battery. Then the potential difference between its head and tail can be upto
(A) 600 V (B) 440 V (C) 220 V (D) 160 V

4) The sum of electric and magnetic force is called
(A) Maxwell force (B) Newton's force (C) Lorentz force (D) Centripetal force

5) Output waveform of sweep or time base generator is
(A) Saw tooth wave (B) Digital wave (C) Sinusoidal wave (D) Square wave

6) Emf is induced due to change in
(A) Electric flux (B) Magnetic flux (C) Electric potential (D) Electric current

7) When the motor is just started, its back emf is
(A) Maximum (B) Minimum (C) Almost zero (D) Equal to current

8) An A.C Voltmeter reads 220V, its peak value will be
(A) 255 V (B) 311.12 V (C) 300 V (D) 200 V

9) When we acclerate the charge, which type of waves are produced?
(A) Mechanical waves (B) Travelling waves (C) Stationary waves (D) Electromagnetic waves

10) A device used to detect very weak magnetic fields produced by brain is named as
(A) MRI (B) CAT Scans (C) SQUIDS (D) C.R.O

11) The magnitude of voltage gain of an amplifier having r_{ie}=1 ohm, β = 100 and R_c=200 ohm is
(A) 2000 (B) 1000 (C) 500 (D) 5

12) Which one is used as temperature sensor in electrical circuit?
(A) Capacitor (B) diode (C) LDR (D) Thermistor

13) The rest mass of photon is
(A) infinite (B) zero (C) 1.6×10^{-27} kg (D) 3×10^{8} kg

14) The materialization of energy takes place in the process of
(A) photoelectric effect (B) Compton effect (C) Pair Production (D) Annihilation of matter

15) The unit of Rydberg's constant R_H is
(A) ms^{-1} (B) m (C) m^2 (D) m^{-1}

16) The unit of decay constant is
(A) Second (B) $(Second)^{-1}$ (C) m^{-1} (D) m.K

17) Half life of radioactive isotope of Iodine-131 is
(A) 6 days (B) 8 days (C) 10 days (D) 12 days

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Physics (Subjective) **(Group I)** (Session 2018-20 to 2020-22) (Inter Part - II) **Paper (II)**

Time Allowed: 2.40 hours **Section -------- I** Maximum Marks: 68

2. Answer briefly any Eight parts from the followings:- SGD-G1-228 **× 2 = 16**

(i) How can you identify that which plate of a capacitor is positively charged?

(ii) Suppose that you follow an electric field line due to positive point charge. Do electric field and the potential increase or decrease?

(iii) What is meant by EEG and ECG? **(iv)** Show that $1\ eV = 1.6\times10^{-19} J$

(v) Why the voltmeter should have a very high resistance?

(vi) Is it possible to orient a current loop in a uniform magnetic Field such that the loop will not tend to rotate? Explain.

(vii) Write any two uses of CRO. **(viii)** What is dead beat galvanometer?

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

(x) What do you understand by "background" radiations? State two sources of this radiation.

(xi) Define mass defect and binding energy. **(xii)** What are basic forces of nature?

3. Answer briefly any Eight parts from the followings:- **8 × 2 = 16**

(i) A charge of 90 C passes through a wire in 1 hour and 15 minute. What is the current in the wire.

(ii) Why does the resistance of a conductor rise with temperature?

(iii) Differentiate between electro motive force (EMF) and potential difference?

(iv) What do you mean by phase lag and phase lead?

(v) How does doubling the frequency affect the reactance of (a) an inductor (b) a capacitor

(vi) Explain the conditions under which electromagnetic waves are produced from a source?

(vii) Differentiate between ductile and brittle substances; Give Examples?

(viii) Define retentivity and coercive current?

(ix) What is meant by para, dia and ferromagnetic substances? Give examples for each.

(x) The anode of diode is 0.2 V positive with respect to its cathode. Is it forward biased?

(xi) Why a photodiode is operated in reverse biased state?

(xii) Define rectification. Draw a circuit diagram of half wave rectification.

4. Answer briefly any Six parts from the followings:- **6 × 2 = 12**

(i) Write any two methods in which current induce in a coil.

(ii) Show that $\in$ and $\frac{\Delta\phi}{\Delta t}$ have same units. **(iii)** Why the motor is overloaded? Give its Reason.

(iv) Does the induce emf always act to decrease the Magnetic flux through the circuit?

(v) What are the measurement on which two observers in relative motion will always agree upon?

(vi) As a solid is heated and begin to glow, why does it first appear red?

(vii) Write two postulates of special theory of relativity.

(viii) Can X-rays be reflected, refracted Diffracted and Polarized just like any other waves? Explain.

(ix) Is energy conserved when an atom emit a photon of light.

Note: Attempt any three questions. **Section ---------- II** **(8 × 3 = 24)**

5. (a) What is motional emf. Derive an expression for it.

(b) How fast must a proton move in a magnetic field of 2.50×10^{-3} T such that magnetic force is equal to its weight.

6. (a) What is the behaviour of A.C. current and voltage in an inductor? Discuss power loss through an inductor over a period.

(b) The current flowing into the base of a transistor is 100 μA. Find its collector current and its emitter current, if the value of current gain is 100.

7. (a) Explain Photo electric effect. Write its experimental results, also the failure of classical theory.

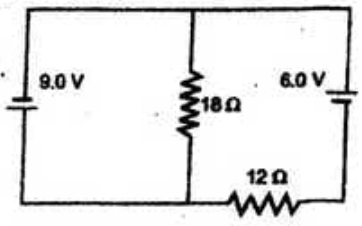
(b) What stress would cause a wire to increase in length by 0.01%, if the Young's modulus of wire is 12×10^{10} Pa. What force would produce this stress, if the diameter of wire is 0.56 mm.

8. (a) What is meant by half life of radioactive element? How it can be determined by the decay of radioactive element.

(b) An Electron jumps a level $E_i = -3.5\times10^{-19}$ J to $E_f = -120\times10^{-18}$ J What is the wavelength of emitted light?

9. (a) Explain capacitance of parallel plate capacitor. What happens when a dielectric insulator is placed between the plates?

(b) Find the current which flows in all the resistance of the given circuit.



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(Inter Part – II) (Session 2017-19 to 2019-21) Sig. of Student ----------

Physics (Objective) **(Group I)** SGD-I-21 **Paper (II)**

Time Allowed:- 20 minutes **PAPER CODE 4471** Maximum 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. Write **PAPER CODE**, which is printed on this question paper, on the both sides of the Answer Sheet and fill bubbles accordingly. Otherwise the student will be responsible for the situation. Use of Ink Remover or white correcting fluid is not allowed.

Q. 1

1) A parallel plate capacitor with oil between the plate ($\varepsilon_r = 2$) has a capacitance C. If the oil is removed then capacitance of capacitor becomes.

(A) C (B) $\frac{C}{2}$ (C) $\frac{C}{\sqrt{2}}$ (D) $\sqrt{2C}$

2) An ECG records the _____ between points on human skin generated by electrical process in the heart.
(A) Heart beat (B) Pulse rate (C) Voltage (D). Pressure

3) If the length of the conductor is doubled and its cross sectional area is halved, its conductance will
(A) Increases four times (B) Becomes one-fourth (C) Becomes one-half (D) Remains unchanged

4) For a current carrying solenoid the term 'n' has unit as
(A) No unit (B) m (C) m^{-1} (D) m^{-2}

5) Two long parallel wires carrying current in the same direction.
(A) Attract (B) Repel (C) Turn (D) No effect

6) The current in a coil changes from 0 to 2 A in 0.05 s. If the induced emf is 80 V, the self inductance of the coil is
(A) 1 H (B) 0.5 H (C) 1.5 H (D) 2 H

7) Maximum motional emf in a conductor is given by VBL. At which angle the conductor moves in magnetic field such that emf in it becomes half then its maximum value is
(A) 0 °C (B) 30° (C) 45° (D) 60°

8) At high frequency the current through a capacitor of A.C. Circuit will be
(A) Large (B) Small (C) Infinite (D) Zero

9) With increase in frequency of an A.C. supply, the impedance of RLC series circuit.
(A) Decreases (B) Increases (C) Remains constant (D) Ist decrease, become minimum and then increase

10) Curie temperature for iron is about
(A) 750 K (B) 570 K (C) 1023 K (D) 670 K

11) If R_1 = infinity and $R_2 = 0$, then gain of non-inverting amplifier is
(A) 0 (B) 1 (C) 2 (D) Infinity

12) The term transistor Stands for
(A) Transfer of resistance (B) Transfer of voltage (C) Transfer of current (D) All of these

13) In the equation $\Delta\lambda = \frac{h}{m_o c}(1-\cos\theta)$ which factor is called Compton wavelength
(A) $\frac{h}{m_o c}$ (B) $\frac{1}{m_o c}$ (C) $(1-\cos\theta)$ (D) $\frac{h}{m_o c}(1-\cos\theta)$

14) In photoelectric effect if the intensity of light is made twice than initial value. The maximum K.E of photoelectron becomes
(A) Same (B) Double (C) Half (D) Four times

15) The energy of the 4th orbit in hydrogen atom is
(A) -13.6 eV (B) - 0.85 eV (C) -3.40 eV (D) -1.51 eV

16) In which nuclear detector, visible path of ionizing particle is shown
(A) Wilson cloud chamber (B) GM Counter (C) Solid State detector (D) All of these

17) The binding energy per nucleon is
(A) Greatest for heavy nuclei (B) Least for heavy nuclei (C) Greatest for light nuclei (D) Greatest for medium weight nuclei

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ysics (Subjective) **(Group I)** (Session 2017-19 to 2019-21) (Inter Part - II) **Paper (II)**

ne Allowed: 2.40 hours **Section --------- I** Maximum Marks: 68

Answer briefly any Eight parts from the followings:- SGD-I-21 **8 × 2 = 16**

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

(ii) How can you identify that which plate of a capacitor is positively charged?

(iii) State Gauss's law and write mathematical expression. (iv) Write four properties of electric field lines.

(v) How can a current loop be used to determine the presence of a magnetic field in a given region of space?

(vi) Why does the picture on a TV screen become distroted when a magnet is brought near the screen?

(vii) State Ampere's circuital law and write its mathematically expression.

(viii) What is CRO? Write only its main parts. (ix) Show that ε and $\frac{\Delta\Phi}{\Delta t}$ have the same unit.

(x) Does the induced emf always act to decrease the magnetic flux through a circuit?

(xi) Define mutual inductance and write its unit.

(xii) Write the factors upon which self inductance depends?

3. **Answer briefly any Eight parts from the followings:-** **8 × 2 = 16**

(i) What is thermistor? (ii) Under what conditions, The emf of a cell and terminal potential are same.

(iii) Explain why the terminal potential of a battery decreases when the current drawn from it is increased.

(iv) In R – L circuit, will the current lag or lead? Illustrate your answer by a vector diagram.

(v) Define instantaneous and peak value of current. (vi) Write down two properties of RLC parallel circuit.

(vii) What is meant by Hystersis loss? How is it used in the construction of a transformer.

(viii) Discuss the mechanism of electrical conduction by holes and electrons in semiconductor element.

(ix) What is difference between Elasticity and plasticity. (x) Why is the base current is very small?

(xi) The anode of a diode is 0.2 V positive with respect to its cathode. Is it forward biased.

(xii) Define current gain of a transistor. Give its unit.

4. **Answer briefly any Six parts from the followings:-** **6 × 2 = 12**

(i) Which photon, red, green, or blue carries the most. (a) energy and (b) momentum

(ii) Will bright light ejects more electrons from a metal surface than dimmer light of the same colour?

(iii) Define Stefen's Boltzmann Law. Also give the value of Stefen's constant.

(iv) Can X-ray be reflected, refracted, diffracted and polarized just like any other wave? Explain.

(v) Explain why laser action cannot occur without population inversion between atomic levels?

(vi) What do we mean by the term critical mass?

(vii) A particle which produces more ionization is less penetrating. Why?

(viii) If someone accidently swallows an α-source and a β-source. Which would be the more dangerous to him? Explain why? (ix) Define the terms mass defect and binding energy.

Note: Attempt any three questions. **Section ---------- II** **(8 × 3 = 24)**

5. (a) Explain in detail, electrical power and power dissipation in resistor.
   (b) The time constant of a series RC. circuit is t=RC. Verify that an ohm times farad is equivalent to second.

6. (a) Derive an expression for torque on current carrying coil in uniform magnetic field.
   (b) A coil of 10 turns and 35 cm^2 area is in a perpendicular magnetic field of 0.5 T. The coil is pulled out of the field in 1.0 s. Find the induced emf in the coil as it is pulled out of the field.

7. (a) What is operational amplifier? How op. Amplifier is used as Non Inverting Amplifier?
   (b) A 10 mH, 20 Ω coil is connected across 240 V and $180/\pi$ Hz source. How much power does it dissipate.

8. (a) What are intrinsic and extrinsic semi conductors? Describe the formation of N-type and P-type semi conductors.
   (b) If $^{233}_{92}U$ decays twice by α – emission, what is the resulting isotope?

9. (a) State Postulates of Bohr's model of Hydrogen atom and show that hydrogen atom has quantized radii.
   (b) An electron is accelerated through a potential difference of 50 V calculate its de-Broglie wave length.

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Physics (Objective) (Group II) S40-II-21 Paper (II)

Time Allowed:- 20 minutes **PAPER CODE 4478** Maximum 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. Write **PAPER CODE**, which is printed on this question paper, on the both sides of the Answer Sheet and fill bubbles accordingly, otherwise the student will be responsible for the situation. Use of Ink Remover or white correcting fluid is not allowed.

Q. 1

1) In the Bohr's model of hydrogen atom, the lowest orbit corresponds to
(A) Infinite energy (B) Zero energy (C) Minimum energy (D) Maximum energy

2) Which of the following conservation law hold in nuclear transmutation.
(A) Mass (B) Energy (C) Momentum (D) All of these

3) The building blocks of protons and neutrons are
(A) Ions (B) Electrons (C) Positrons (D) Quarks

4) The energy density in a capacitor is directly proportional to
(A) $\varepsilon_o \varepsilon_r$ (B) E^2 (C) C^2 (D) V^2

5) The negative sign in the expression of potential gradiant $\vec{E} = -\frac{\Delta \vec{V}}{\Delta r}$ shows that, direction of $\vec{E}$ is along.
(A) Increasing potential (B) Decreasing potential (C) Increasing strength (D) Negative potential

6) Colour code of 10 Ω resistance with 5% tolerance is
(A) Black, black, Brown, Silver (B) Brown, black, black, Gold (C) Black, brown, black, Gold (D) Brown, brown, black, Gold

7) The brightness of spot on C.R.O screen is controlled by
(A) Anodes (B) Cathodes (C) Grid (D) Plates

8) Magnetic flux density at a point due to current carrying coil is determined by
(A) Ampere's Law (B) Gauss's Law (C) Faraday's Law (D) Lenz's Law

9) The direction of induced current is always so as to oppose the change which causes the current is
(A) Faraday's Law (B) Lenz's Law (C) Ohm's Law (D) Kirchhoff's Ist rule

10) When current flowing through an inductor is doubled, then energy stored in it becomes.
(A) Half (B) Four times (C) One fourth (D) Double

11) In RLC series circuit, the current at resonance frequency is
(A) Minimum (B) Maximum (C) Zero (D) Infinite

12) When 10 V are applied to an A.C circuit, the current flowing in it is 100 mA, its impedance is
(A) 50 Ω (B) 75 Ω (C) 100 Ω (D) 90 Ω

13) If stress is increased beyond the elastic limit of a material, it becomes permanently changed, this behaviour of material is called.
(A) Elasticity (B) Plasticity (C) Yield strength (D) Ultimate tensile strength

14) The potential barrier of silicon at room temperature is
(A) 0.3 V (B) 0.7 V (C) 3.0 V (D) 7.0 V

15) The voltage gain of an amplifier having $r_{ie} = 1\Omega$, $\beta = 100$, $R_c = 20\Omega$ is
(A) 2000 (B) 1000 (C) 500 (D) 5

16) When a photon collide with an electron, which of following of photon increases.
(A) Frequency (B) Energy (C) Wavelength (D) Mass

17) Which of the following explain particle nature of light?
(A) Interference (B) Diffraction (C) Photoelectric effect (D) Polarization

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ics (Subjective) (Group II) (Session 2017-19 to 2019-21) (Inter Part - II) **Paper (II)**

Allowed: 2.40 hours **Section --------- I** Maximum Marks: 68

Answer briefly any Eight parts from the followings:- SGD-II-21 **8 × 2 = 16**

(i) How can you identify that which plate of a capacitor is positively charged?

(ii) Do electrons tend to go to region of High potential or of low potential?

(iii) How much energy will store in a capacitor of capacitance 1.0 μF having electrical potential of 10.0 V between the parallel plates capactor. (iv) Define electron volt. Is it a unit of electrical potential or energy.

(v) Is it possible to orient a current loop in a uniform magnetic field such that the loop will not tend to rotate? Explain.

(vi) How can you use a magnetic field to separate isotopes of chemical element?

(vii) A current carrying rectangular coil is rotating in a magnetic field. What factors does the torque of coil depend?

(viii) How can phase difference between two voltages be obtained by Cathode Ray Oscilloscope?

(ix) Does the induced emf in a circuit depend on the resistance of the circuit? Does the induced current depend on the resistance of the circuit? (x) Show that ε (emf) and $\frac{\Delta\phi}{\Delta t}$ have the same units.

(xi) What will be the energy density of current carrying solenoid if magnetic field is doubled?

(xii) Does the self inductance depend on the rate of change of current?

3. **Answer briefly any Eight parts from the followings:-** **8 × 2 = 16**

(i) State Kirchhoff's Rules. (ii) A sinusoidal current has rms value of 10 A. What is the maximum or peak value?

(iii) A potential difference is applied across the ends of a copper wire. What is the effect on the drift velocity of free electrons by decreasing the length and the temperature of the wire?

(iv) What is Wheatstone bridge? How can it be used to determine an unknown resistance?

(v) A circuit contains an iron-cored inductor, a switch and a D.C. source arranged in series. The switch is closed and after an interval reopened. Explain why a spark jumps across the switch contacts?

(vi) Why the choke is used in A.C. circuits? (vii) Define Retantivity and coercive current.

(viii) Write the name of four applications of superconductors.

(ix) Explain briefly the semiconductors in terms of energy band theory. (x) Write name of applications of photodiode.

(xi) What is the biasing requirement of the junctions of a transistor for its normal operation? Explain how these requirements are met in a common emitter amplifier.

(xii) How does the motion of an electron in a n-type substance differ from the motion of holes in a p-type substance?

4. ***Answer briefly any Six parts from the followings:-*** **6 × 2 = 12**

(i) Can pair production takes place in vacuum? Explain. (ii) Is it possible to create a single electron from energy? Explain.

(iii) We do not notice the de Broglie wavelength for a pitched cricket ball. Explain why?

(iv) What do we mean when we say that the atom is excited? (v) Write down any four uses of Laser.

(vi) What do you understand by "background radiation"? State two sources of this radiation.

(vii) What information is revealed by the length and shape of the tracks of an incident particle in Wilson cloud chamber?

(viii) Describe the principle of operation of a solid state detector of ionizing radiation in terms of generation and detection of charge carriers.

(ix) Discuss the advantages and disadvantages of nuclear power compared to the use of fossil fuel generated power.

Note: Attempt any three questions. **Section ---------- II** **(8 × 3 = 24)**

5. (a) What is Wheatstone bridge? Derive a relation for its balancing condition.
   (b) Two opposite point charges each of magnitude q are separated by a distance 2d. What is the electric potential at a point P mid-way between them.

6. (a) Derive the expression for torque on a current carrying coil in a uniform magnetic field.
   (b) A metal rod of length 25 cm is moving at a speed of 0.5 ms^{-1} in a direction perpendicular to 0.25 T magnetic field. Find the emf produced in the rod?

7. (a) How an operational amplifier behaves as non-inverting amplifier? Derive a relation for voltage gain of the non-inverting amplifier.
   (b) An alternating source of emf 12 V and frequency 50 Hz is applied to a capacitor of capacitance 3 μF in series with a resistor of resistance 1 $k\ \Omega$. Calculate the phase angle.

8. (a) What are the Radiation Detectors? What do you know about "Wilson's cloud chamber"? Explain its principle, construction and working.
   (b) What stress would cause a wire to increase in length by 0.01 % if the Young's modulus of the wire is 12×10^{10} Pa. What force would produce this Stress if the diameter of the wire is 0.56 mm.

9. (a) What is De-Brogli hypothesis of wave nature of particles? How Davisson and Germer experiment confirmed it?
   (b) Find the speed of electron in the first Bohr orbit.

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(Inter Part – II) (Session 2015-17 to 2017-19) Sig. of Student ----------

Physics (Objective) **(Group I)** **Paper (II)**

Time Allowed:- 20 minutes **PAPER CODE 4475** Maximum 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. Write **PAPER CODE**, which is printed on this question paper, on the both sides of the Answer Sheet and fill bubbles accordingly, otherwise the student will be responsible for the situation. Use of Ink Remover or white correcting fluid is not allowed.

Q. 1

1) Types of quarks are
(A) 2 (B) 4 (C) 6 (D) 8

2) In liquid metal fast breeder reactor the type of uranium used is
(A) $^{235}_{92}U$ (B) $^{238}_{92}U$ (C) $^{234}_{92}U$ (D) $^{239}_{92}U$

3) The force between two charges is 28 N. The paraffin wax of relative permitivity 2.8 is introduced between the charges as medium then force reduces to
(A) 25 N (B) 20 N (C) 10 N (D) 15 N

4) A charge of $10^{-10}C$ between two parallel plates 1 cm apart experience a force of 10^{-5} N. The p.d. between the plates is
(A) 10 V (B) 10^2 V (C) 10^3 V (D) 10^4 V

5) Tolerance for silver colour is
(A) ±10% (B) ±15% (C) ±20% (D) ±5%

6) Two parallel wires carrying currents in opposite direction.
(A) Repel each other (B) Attract each other (C) Neither attract nor repel (D) Stick to each other

7) A 5m wire carrying current 2 A at right angle to uniform magnetic field of 0.5 T. The force on the wire is
(A) 1.5 N (B) 5 N (C) 2.5 N (D) 4 N

8) If the coil is wound on iron core, the flux through it
(A) Decreases (B) Becomes zero (C) Remains constant (D) Increases

9) Energy stored per unit volume in magnetic field is called
(A) Energy density (B) Electric flux (C) Work (D) Power

10) S.I unit of reactance is
(A) Farad (B) Volt (C) Ampere (D) Ohm

11) The device which allows only the flow of D.C. is
(A) Capacitor (B) Resistor (C) Inductor (D) Generator

12) A vacant or partially filled band is called
(A) Fermi Band (B) Valence Band (C) Forbidden Band (D) Conduction Band

13) For normal operation of transistor, the Emitter-Base junction is always
(A) Forward Biased (B) Reverse Biased (C) Unbiased (D) Grounded

14) The S.I unit of current gain is
(A) Volt (B) Ampere (C) Coulomb (D) No unit

15) The factor $\frac{h}{m_o c}$ in Compton effect has the dimensions of
(A) Pressure (B) Length (C) Mass (D) Momentum

16) The materialization of energy takes place in the process of
(A) Photoelectric effect (B) Compton effect (C) Pair production (D) Annihilation of matter

17) Joule-Second is the unit of
(A) Energy (B) Heat (C) Plank's constant (D) Power

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Physics (Subjective) (Group I) (Session 2015-17 to 2017-19) (Inter Part - II) **Paper (II)**

Time Allowed: 2.40 hours **Section ---------- I** Maximum Marks: 68

2. Answer briefly any Eight parts from the followings:- 8 × 2 = 16

(i) Define Electrostatics and Xerography. (ii) Define Gaussian surface and Electric lines of force.

(iii) The potential is constant through out a given region of space. Is the electric field is zero or non-zero in this region? Explain.

(iv) How can you identify that which plate of a capacitor is positively charged?

(v) Define magnetic induction and Tesla. (vi) Define Magnetic Flux and Flux Density.

(vii) Why the resistance of an ammeter should be very low?

(viii) Why the voltmeter should have a very high resistance.

(ix) Define electromagnetic induction and Induced emf. (x) Define Mutual induction and Henry.

(xi) Four unmarked wires emerge from a transformer. What steps would you take to determine the turns ratio?

(xii) Can a D.C motor be turned into a D.C. generator? What changes are required to be done?

3. Answer briefly any Eight parts from the followings:- 8 × 2 = 16

(i) What is wheatstone bridge? How can it be used to determine an unknown resistance?

(ii) Is the filament resistance lower or higher in a 500 W, 220 V light bulb than in a 100 W, 220 V bulb?

(iii) Define sources of current and give its two examples.

(iv) Explain the conditions under which electromagnetic waves are produced from a source?

(v) What is meant by A.M and F.M? (vi) What is choke? Explain. (vii) Explain the term Hysteresis.

(viii) Define stress and strain. What are their SI units? (ix) What are superconductors? Write their types.

(x) What is the biasing requirement of the junctions of a transistor for its normal operation? Explain how these requirements are met in a common emitter amplifier?

(xi) The anode of a diode is 0.2 V positive with respect to its cathode. Is it forward biased?

(xii) Write two characteristics of operational amplifier.

4. Answer briefly any Six parts from the followings:- 6 × 2 = 12

(i) What advantages an electron microscope has over an optical microscope?

(ii) Can pair production take place in vacuum? Explain.

(iii) Find the energy of photon in radiowave of wavelength 100 m.

(iv) Define excitation energy and ionization energy.

(v) Can X-rays be reflected, refracted, diffracted and polarized just like any other waves? Explain.

(vi) Explain briefly fission chain reaction. (vii) How can radioactivity help in the treatment of cancer.

(viii) Define hadrons. Also differentiate between baryons and mesons.

(ix) What information is revealed by the length and shape of the tracks of an incident particle in Wilson cloud chamber?

Note: Attempt any three questions. Section ---------- II (8 × 3 = 24)

5. **(a)** What is electric potential? Find electric potential at a point due to a point charge.

(b) A rectangular bar of iron is 2.0 cm by 2.0 cm in cross section and 40 cm long. Calculate its resistance if the resistivity of iron is $11\times10^{-8}\Omega m$

6. **(a)** What is A.C Generator. Discuss the principle, construction and working of an A.C Generator. Also find expression for induced emf and current.

(b) How fast must a proton move in a magnetic field of $2.50\times10^{-3}T$ such that the magnetic force is equal to its weight?

7. **(a)** Describe R-L-C series circuit, derive the expression for its resonance frequency and write down its properties.

(b) In a certain circuit, the transistor has a collector current of 10mA and a base current of $40\mu A$. What is the gain of the transistor?

8. **(a)** What is Doping, Explain formation of n-type and p-type semiconductor.

(b) An electron is placed in a box about the size of an atom that is about $1.0\times10^{-10}m$. What is the velocity of the electron.

9. **(a)** What is nuclear reactor? Describe its principle, construction and working.

(b) The wavelength of K X-ray from copper is $1.377\times10^{-10}m$. What is the energy difference between the two levels from which this transition results?

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(Inter Part – II) (Session 2015-17 to 2017-19) Sig. of Student ----------

Physics (Objective) **(Group II)** **Paper (II)**

Time Allowed:- 20 minutes **PAPER CODE 4472** Maximum 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. Write **PAPER CODE**, which is printed on this question paper, on the both sides of the Answer Sheet and fill bubbles accordingly, otherwise the student will be responsible for the situation. Use of Ink Remover or white correcting fluid is not allowed.

Q. 1

1) If the distance between two charges is halved, the force between them becomes
(A) Double (B) Half (C) Four times (D) One time

2) When some dielectric is inserted between the plates of a capacitor then capacitance.
(A) Increased (B) Decreased (C) Zero (D) Infinity

3) Kirchhoff's First Rule is a manifestation of Law of conservation of
(A) Mass (B) Energy (C) Charge (D) Momentum

4) Work done on a charge particle moving in a uniform magnetic field is
(A) Maximum (B) Zero (C) Minimum (D) Negative

5) Output wave form of sweep or time base generator is
(A) Saw tooth wave (B) Digital wave (C) Sinusoidal wave (D) Square wave

6) Energy stored in inductor is
(A) $\frac{1}{2} LI$ (B) $\frac{1}{2} L^2 I$ (C) $\frac{1}{2} L^2 I^2$ (D) $\frac{1}{2} LI^2$

7) Which one is not present in A.C generator.
(A) Armature (B) Magnet (C) Slip rings (D) Commutator

8) At high frequency the value of reactance of capacitor is
(A) Small (B) Zero (C) Large (D) Infinite

9) In three phase A.C generator the phase difference between each pair of coil is
(A) 45^o (B) 60^o (C) 90^o (D) 120^o

10) The substance in which atoms cooperate with each other in such a way, so as to exhibit a strong magnetic field is called
(A) Paramagnetic (B) Diamagnetic (C) Ferro magnetic (D) Non magnetic

11) A sensor of light is
(A) Transistor (B) LED (C) Diode (D) Light dependent resistance

12) Find the gain of inverting amplifier of external resistance $R_1 = 10K\Omega$ and $R_2 = 100K\Omega$
(A) -5 (B) -10 (C) -2 (D) 50

13) The value of Stefen's constant is
(A) $2.9\times10^{-3} mK$ (B) $1.097\times10^{7} m^{-1}$ (C) $6.63\times10^{-34} Js$ (D) $5.67\times10^{-8} Wm^{-2}K^{-4}$

14) The factor $\frac{h}{m_o c}$ has the dimension of
(A) Length (B) Time (C) Mass (D) Energy

15) Which series lies in the ultra violet region
(A) Balmer series (B) Bracket series (C) Pfund series (D) Lyman series

16) Absorbed dose D is defined as
(A) m/E (B) E/m (C) C/m (D) E/C

17) A proton consists of quarks which are
(A) 2 up and 1 down (B) 1 up and 2 down (C) All up (D) All down

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Physics (Subjective) **Group (II)** (Session 2015-17 to 2017-19) **Paper (II)**

Time Allowed: 2.40 hours **Section ---------- I** (Inter Part - II) Maximum Marks 68

2. Answer briefly any Eight parts from the followings:- **8 × 2 = 16**

(i) Describe the force or forces on a positive point charge when placed between parallel plates with opposite and equal charges.

(ii) Is $\vec{E}$ necessarily zero inside a charged rubber balloon if balloon is spherical? Assume that charge is distributed uniformaly over the surface.

(iii) What is time constant of a capacitor? **(iv)** Prove that $1\frac{volt}{meter} = 1\frac{newton}{coulomb}$

(v) Suppose that a charge q is moving in a uniform magnetic field with a velocity v. Why there is no work done by the magnetic force that acts on the charge q ?

(vi) Why the resistance of an ammeter should be very low? **(vii)** Write uses of CRO.

(viii) Define magnetic flux and one tesla. **(ix)** State Faraday's Law and write its mathematical form.

(x) How power loss due to eddy currents in a transformer can be reduced?

(xi) Does the induced emf always act to decrease the magnetic flux through a circuit?

(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. Answer briefly any Eight parts from the followings:- **8 × 2 = 16**

(i) Do bends in a wire affect its electrical resistance.

(ii) What are the difficulties in testing whether the filament of a lighted bulb obeys Ohms law?

(iii) Under what conditions e.m.f of a cell and terminal potential difference become equal.

(iv) What is choke? Write its main use? **(v)** Define ultimate tensile strength and fracture stress.

(vi) How will you obtain N-type and P-type material from silicon?

(vii) How many times per second will an incandasent lamp reach maximum brilliance when connected to a 50 Hz source?

(viii) A sinusoidal current has rms value of 10 A. What is the maximum or peak value.

(ix) Distinguish between crystalline and polymeric solids.

(x) The anode of a diode is 0.2 V positive with respect to cathode. Is it forward biased?

(xi) Why a photo diode is operated in a reverse biased state?

(xii) Name any two basic characteristics of op-Amplifier. Also give their approximate values.

4. Answer briefly any Six parts from the followings:- **6 × 2 = 12**

(i) Does brightness of beam of light primarily depends upon the frequency of photons or on the number of photons?

(ii) Why can red light be used in a photographic dark room when developing films but not blue or white light?

(iii) We donot notice the de-Broglie wavelength for a pitched cricket ball. Explain why?

(iv) Why Laser action cannot occur without population inversion between atomic levels?

(v) What is meant by line spectrum? Explain how line spectrum can be used for the identification of elements?

(vi) If a nucleus has a half life of 1 year, does this mean that it will completely decay after 2 years? Explain

(vii) What is radioactive tracer? Describe one application in medicine and agriculture.

(viii) Write a short note on Geiger Muller Counter. **(ix)** Define Mass defect and Binding energy.

Note: Attempt any three questions. Section ---------- II **(8 × 3 = 24)**

5. **(a)** Derive an Expression for Energy stored by the capacitor.

(b) 1.0×10^{7} electrons pass through a conductor in $1.0\mu s$. Find the current in ampere flowing through the conductor. Electronic charge is $1.6\times10^{-19}C$

6. **(a)** Define motional emf. Derive a relation for motional emf.

(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.

7. **(a)** What is a transistor? Describe the use of transistor as an amplifier and derive its voltage gain

(b) An alternating source of emf 12 V and frequency 50 Hz is applied to a capacitor of capacitance $3\mu F$ in series with a resistor of resistance $1K\Omega$. Calculate the phase angle.

8. **(a)** What is energy band theory? How it can be used to explain the features of electrical conductors, insulators and semiconductors.

(b) What is the mass of a 70 kg man in a space rocket travelling at 0.8 c from us as measured from earth

9. **(a)** Define solid state detector. Give its principle, construction and its working.

Find the speed of electron in the first Bohr orbit.

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Physics (Subjective) Group (II) (Session 2015-17 & 2016-18) Paper (II)

Time Allowed: 2.40 hours **Section ---------- I** (Inter Part - II) Maximum Marks: 68

2. Answer briefly any Eight parts from the followings:- 8 × 2 = 16

(i) Electric lines of force never cross. Why? (ii) Show that the unit of time constant RC is second .

(iii) What is the electric intensity at a distance 'r' 100 cm due to charge $10\,\mu c$?

(iv) What is the effect of Polarization on the capacitance of capacitor?

(v) Suppose that a charge 'q' is moving in a uniform magnetic field with velocity 'v'. Why is there no work done by the magnetic force that acts on the charge q ?

(vi) If a charged particle moves in a straight line through some region of space, can you say that magnetic field in the region is zero?

(vii) How can you use a magnetic field to separate isotopes of chemical element?

(viii) What is the senstivity factor of Galvanometer?

(ix) How would you position a flat loop of wire in a changing magnetic field so that there is no emf induced in the loop?

(x) Is it possible to change both area of the loop and the magnetic field passing through the loop and still not have an induced emf in the loop?

(xi) Can an electric motor be used to drive an electric generator with the output from the generator being used to operate the motor?

(xii) Does the induced emf always act to decrease the magnetic flux through a circuit?

3. Answer briefly any Eight parts from the followings:- 8 × 2 = 16

(i) Differentiate between resistance and resistivity, give their units.

(ii) Why does the resistance of a conductor rise with temperature.

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

(iv) Define impedance and resonant frequency, Also write their formula.

(v) How the reception of a particular radio station is selected on your radio set.

(vi) How does doubling the frequency affect the reactance of (a) an inductor (b) a capacitor

(vii) Define saturation and Remanence of Hysteresis loop. (viii) Define stress and strain what are their S.I units.

(ix) What is the difference between intrinsic and extrinsic Semiconductor.

(x) Define rectification. Draw a circuit diagram of half wave rectifier.

(xi) What do you know about Light emitting diode. (xii) Why charge carriers are not present in the depletion region?

4. Answer briefly any Six parts from the followings:- 6 × 2 = 12

(i) When does light behave as a wave? When does it behave as a particle.

(ii) Can pair production take place in vaccum? Explain.

(iii) Define Special Theory of Relativity and general theory of relativity.

(iv) Is energy conserved when an atom emits a photon of light? (v) Define Holography and Population inversion.

(vi) What factors make a fusion reaction difficult to achieve? (vii) Why are heavy nuclei unstable.?

(viii) What do we mean the term critical mass? (ix) Define Leptons and Hadrons.

Note: Attempt any three questions. Section ---------- II (8 × 3 = 24)

5. (a) What is wheatstone bridge? Describe its construction and working. How can it be used to find the unknown resistance of a wire?

(b) Determine the electric field at the position $\vec{r} = (4\hat{i} + 3\hat{j})\,m$ caused by a point charge $q = 5.0 \times 10^{-6} C$ placed at origin.

6. (a) What is a galvanometer? How it is converted into ammeter and voltmeter.

(b) A circular coil has 15 turns of radius 2 cm each. The plane of coil lies at 40° to a uniform magnetic field of 0.2 T. If the field is increased by 0.5 T in 0.2 s. Find the magnitude of induced emf.

7. (a) What is operational amplifier? How op-Amplifier is used as an inverting amplifier?

(b) Find the value of current flowing through a capacitance $0.5\ \mu F$ when connected to a source of 150 V at 50 Hz.

8. (a) What do you meant by wave nature of particles? Explain how it was proved for electrons by Davisson and Germer experiment.

(b) A wire 2.5 m long and cross-sectional area $10^{-5} m^2$ is stretched by 1.5 mm by a force of 100 N in the elastic region. Calculate (i) Young's Modulus (ii) The energy stored in the wire.

9. (a) What is LASER? Discuss the working of laser by explaining the stimulated emission of radiation and population inversion.

(b) A 75 kg person receives a whole body radiation dose of 24 m-rad, delivered by α – particles for which RBE factor is 12. calculate (i) The absorbed dose energy in joules, and (ii) The equivalent dose in rem.

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(Inter Part – II) (Session 2015-17 & 2016-18) Sig. of Student ----------

Physics (Objective) **(Group I)** **Paper (II)**

Time Allowed:- 20 minutes **PAPER CODE 4477** Maximum 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. Write **PAPER CODE**, which is printed on this question paper, on the both sides of the Answer Sheet and fill bubbles accordingly, otherwise the student will be responsible for the situation. Use of Ink Remover or white correcting fluid is not allowed.

Q. 1

1) The reverse current through a semi conductor diode is due to
(A) Minority carriers (B) Majority carriers (C) Holes (D) Electrons

2) Amount of energy released due to complete conversion of 1 Kg mass into energy is
(A) $9\times10^{16}\,J$ (B) $9\times10^{9}\,J$ (C) $9\times10^{20}\,J$ (D) $3\times10^{8}\,J$

3) The momentum of photon of frequency 'f' is
(A) hc / f (B) hf / c (C) f / hc (D) c / hf

4) An A.C. voltmeter reads 220 V, its peak value will be
(A) 255 V (B) 311.12 V (C) 300 V (D) 200 V

5) In an electronic transition atom cannot emit
(A) Infrared radiation (B) Ultra violet radiation (C) $\gamma - ray$ (D) Visible light

6) The number of neutron present in a nucleus is given by
(A) N = A + Z (B) N = A – Z (C) N = Z – A (D) N = A × Z

7) The amount of energy equivalent to 1 a.m.u. is
(A) 9.315 MeV (B) 93.15 MeV (C) 931.00 MeV (D) 0.931 MeV

8) If electric and gravitational forces on an electron balance each other, then electric intensity will be
(A) $E=\frac{mg}{q}$ (B) $E=\frac{q}{mg}$ (C) $E=\frac{F_e}{q}$ (D) $E=\frac{1}{4\pi\epsilon_o}\frac{q}{r^2}$

9) A charge of 4 Coulomb is in the field of intensity 4 N/C. The force on the charge is
(A) 8 N (B) 16 N (C) 4 N (D) 1 N

10) The reciprocal of resistance is called
(A) Reactance (B) Inductance (C) Conductance (D) Conductivity

11) The force on current carrying conductor placed in magnetic field is expressed by
(A) $\vec{F}=I\vec{L}\cdot\vec{B}$ (B) $\vec{F}=I\vec{L}\times\vec{B}$ (C) $\vec{F}=I^2\vec{L}\times\vec{B}$ (D) $\vec{F}=I\vec{B}\times\vec{L}$

12) Two parallel wires carrying currents in opposite direction
(A) Repel each other (B) Attract each other (C) Neither attract nor repel each other (D) Stick to each other

13) Lenz's law is in accordance with the law of conservation of
(A) Momentum (B) Angular Momentum (C) Charge (D) Energy

14) Which of the following converts electrical energy into mechanical energy?
(A) Transformer (B) Motor (C) D.C. generator (D) A.C. generator

15) S.I. unit of reactance is
(A) Farad (B) Volt (C) Ampere (D) Ohm

16) If stress is increased beyond the elastic limit of material, it becomes permanently changed, this behaviour of material is called
(A) Elasticity (B) Plasticity (C) Yield Strength (D) Ultimate tensile Strength

17) The potential barrier for silicon is
(A) 0.3 V (B) 0.7 V (C) 1.0 V (D) 0.1 V

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Physics (Subjective) **Group (I)** (Session 2015-17 & 2016-18) (Inter Part - II) **Paper (II)**

Time Allowed: 2.40 hours **Section ---------- I** Maximum Marks: 68

2. Answer briefly any Eight parts from the followings:- **8 × 2 = 16**

(i) Distinguish between electric field and electric field intensity.
(ii) Prove that unit of series RC circuit is second.
(iii) Suppose that you follow an electric field line due to a positive point charge. Do electric field and the potential increase or decrease. **(iv)** Define dielectric constant and write its formula.
(v) What is the function of grid in cathode ray oscilloscope. **(vi)** How can a galvanometer be made more sensitive.
(vii) How can you use a magnetic field to separate isotopes of chemical element.
(viii) Why the voltmeter should have a very high resistance?
(ix) Four unmarked wires emerge from a transformer. What steps would you take to determine the turns ratio?
(x) Does the induced emf always act to decrease the magnetic flux through a circuit.
(xi) Define mutual induction, write its S.I unit. (xii) Distinguish between A.C generator and transformer.

3. Answer briefly any Eight parts from the followings:- **8 × 2 = 16**

(i) Define Ohmic and non ohmic devices. (ii) Do bends in a wire affect its electrical resistance? Explain.
(iii) Describe a circuit which will give a continuously varying potential.
(iv) Name the device that will (c) permit flow of direct current but oppose the flow of alternating current.
(v) A sinusodial current has rms value of 10A. What is the maximum or peak value?
(vi) Define Alternating current and Choke. **(vii)** Distinguish between intrinsic and extrinsic semiconductors.
(viii) What is meant by Dia and Ferromagnetic substances? Give example for each.
(ix) Define stress and strain. **(x)** Why ordinary silicon diodes do not emit light?
(xi) What is AND Gate. **(xii)** Define Forward Bias and Reversed Bias.

4. Answer briefly any Six parts from the followings:- **6 × 2 = 12**

(i) If electron and a proton have same de-Broglie wavelength, which particle has greater speed?
(ii) Will bright light eject more electrons from metal surface than dimmer light of the same colour? Explain.
(iii) Differentiate between special theory of relativity and general theory of relativity.
(iv) Explain why Laser action can not occur without population inversion between atomic level?
(v) What is a CAT Scanner? **(vi)** What is mass defect?
(vii) A particle which produces more ionization is less penetrating why?
(viii) What information is revealed by the length and shape of the tracks of an incident particle in Wilson cloud chamber? **(ix)** Write the names of any four basic forces of Nature.

Note: Attempt any three questions. Section ---------- II **(8 × 3 = 24)**

5. **(a)** Derive an expression for energy stored in an inductor in terms of magnetic field.
(b) A power line 10 m high carries a current 200 A. Find the magnetic field of the wire at the ground.

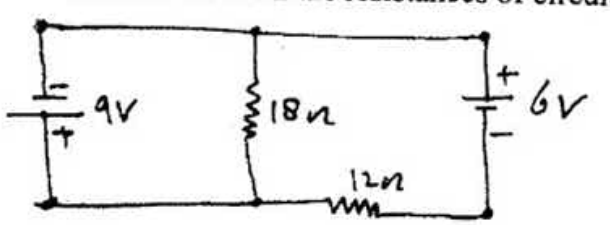
6. **(a)** What are the biasing requirements of the junctions of a transistor for its normal operation? Explain how these requirements are met in a common emitter amplifier. By drawing its circuit diagram calculate its gain.

(b) A 10 mH, 20Ω coil is connected across 240 V and $180/\pi$ Hz source. How much power does it dissipate?

7. **(a)** Define strain energy. How can you explain the strain energy in deformed materials? Also derive relation for strain energy.
(b) A 50 keV photon is Compton scattered by a quasi-free electron. If the scattered photon comes off at 45°, what is its wavelength.

8. **(a)** What are X – rays ? How are they produced.
(b) A sheet of lead 5 mm thick reduces the intensity of a beam of γ – rays by a factor 0.4. Find half value thickness of lead sheet which will reduce the intensity half of its initial value.

9. **(a)** How energy is stored in a capacitor? Derive relations for energy and energy density.
(b) Find the current which flows in all the resistances of circuit shown below.



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(SECTION - II)

5. (a) What is potentiometer? How can it be used as
   i) Potential divider
   ii) Measuring of emf of a cell.
   (b) Two point charges $q_1 = -1.0 \times 10^{-6}$ C and $q_2 = 4.0 \times 10^{-6}$ C are separated by a distance of 3.0 m. Find and justify the zero-field location.
6. (a) What is A.C. generator? Give its principle, construction and working of A.C. generator.
   (b) A power line 10 m high carries a current of 200 A. Find the magnetic field of wire at the ground.
7. (a) Explain the RLC series resonance circuit. Determine the value of resonant frequency and write down its properties.
   (b) The current flowing into the base of transistor is 100 μA. Find its collector current I_C. Its emitter current I_E and the ratio $\frac{I_C}{I_E}$. if the value of current gain β is 100.
8. (a) What is meant by strain energy? Draw force extension graph for a vertically suspended wire stretched by a variable weight at the other end and by its graph derive a relation to calculate its value.
   (b) An electron accelerated through a potential difference of 50 V. Calculate its de Broglie wavelength.
9. (a) What is nuclear reactor? Describe its principle, construction and working.
   (b) Compute the shortest wavelength of radiation in the Balmer series. What value of 'n' must be used?