

Roll No. _____ to be filled in by the candidate

(For All Sessions)

Time: 20 Minutes Marks : 17

Physics (Objective) $P_{09-12-1-23}$ (Group-I)

Note: Write Answers to the Questions on the objective answer sheet provided. Four possible answers A, B, C and 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 basic circuit element in a D.C circuit is:
 - (A) Capacitor
 - (B) Inductor
 - (C) Battery
 - (D) Resistor
2. The critical temperature of mercury is:
 - (A) 4.2 k
 - (B) 1.18 k
 - (C) 3.72 k
 - (D) 7.2 k
3. The open loop gain of op-amplifier is of the order of:
 - (A) 10^2
 - (B) 10^3
 - (C) 10^5
 - (D) 10^4
4. $X = A + B$ is the mathematical notation for:
 - (A) AND gate
 - (B) OR gate
 - (C) NOR gate
 - (D) NAND gate
5. The momentum of a moving photon is:
 - (A) $P = h / \lambda$
 - (B) $P = \lambda / h$
 - (C) $P = hf$
 - (D) $P = mc^2$
6. Pair production can take place by using:
 - (A) X-rays
 - (B) α -rays
 - (C) β -rays
 - (D) γ -rays
7. The value of Rydberg's constant is:
 - (A) $1.0974 \times 10^7 m^{-1}$
 - (B) $1.0974 \times 10^{-7} m^{-1}$
 - (C) $1.0974 \times 10^{-7} m$
 - (D) $1.0974 \times 10^7 m$
8. Half life of uranium -238 is:
 - (A) 4.5×10^{12} years
 - (B) 4.5×10^{11} years
 - (C) 4.5×10^{10} years
 - (D) 4.5×10^9 years
9. The potential difference between anode and cathode in a neon bromine filled G.M counter is:
 - (A) 200 v
 - (B) 300 v
 - (C) 400 v
 - (D) 220 v
10. The number of electron in one coulomb charge is:
 - (A) 6.2×10^{18}
 - (B) 1.6×10^{-19}
 - (C) 6.2×10^{21}
 - (D) 1.6×10^{-27}
11. The S-I unit of electric flux is:
 - (A) Nmc^{-1}
 - (B) Nm^2c^{-1}
 - (C) Nm^2c
 - (D) $Nm^{-2}c^{-1}$
12. A rheostat can be used as:
 - (A) Transformer
 - (B) Amplifier
 - (C) Oscillator
 - (D) Potential divider
13. Lorentz force is known as:
 - (A) $\vec{F} = I(\vec{L} \times \vec{B})$
 - (B) $\vec{F} = q(\vec{v} \times \vec{B})$
 - (C) $\vec{F} = q\vec{E} + q(\vec{v} \times \vec{B})$
 - (D) $\vec{F} = q\vec{E}$
14. DMM stands for:
 - (A) Digital millimeter
 - (B) Digital multimeter
 - (C) Digital measuring meter
 - (D) Digital ammeter
15. When the back emf in a circuit is zero it draws:
 - (A) Zero current
 - (B) Steady average current
 - (C) Minimum current
 - (D) Maximum current
16. The principle of AC generator is based on:
 - (A) Mutual induction
 - (B) Self induction
 - (C) Electromagnetic induction
 - (D) All of these
17. The graph between A.C voltage with time is:
 - (A) Cosine curve
 - (B) Tangent curve
 - (C) Sine curve
 - (D) Cot curve

Physics (Subjective)

Rwp-12-1-23

(GROUP-I)

Time: 2:40 hours

SECTION-I

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

(8x2=16)

- Electric lines of force never cross. why?
- Draw the circuit diagram of charging and discharging of a capacitor.
- Suppose that you follow an electric field line due to a positive point charge. Do electric field and electric potential increase or decrease?
- How Millikan's measured the radius of Droplet during measuring the charge on an electron?
- Is it possible to orient a current loop in a uniform magnetic field such that loop will not tend to rotate? Explain.
- How lamp and scale arrangement is used to measure the angle of deflection of a coil of galvanometer?
- Why the 'Voltmeter' should have very high resistance?
- What is the use of 'Grid' in cathode ray oscilloscope?
- What do you understand by back ground radiation? State the two sources of this radiation.
- Why thermal nuclear reactor so called thermal?
- What factors make a fusion reaction difficult to achieve?
- Describe briefly about 'Leptons'.

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

(8x2=16)

- What is a short circuit and an open circuit?
- Write the equation of balanced Wheatstone Bridge and draw its diagram.
- Why has a thin filament of light bulb more possibility to burn than the thicker one?
- Explain why a spark jumps across a switch contacts when it is reopened in a circuit with D.C source?
- Describe frequency modulation with diagram.
- Explain the relation between frequency of A.C signal and inductive reactance.
- What is strain energy? How it can be calculated from the force-extension graph?
- Differentiate elasticity and plasticity of materials.
- Illustrate by diagram, the energy bands for conductors and insulators.
- What are the semi conductors? Give their examples.
- Draw diagrams of n-p-n transistor with (a): Common-Emitter and (b): Common-Base Configurations.
- What is an operational amplifier? Draw its diagram.

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

(6x2=12)

- How power is transferred in a transformer without transfer of charge?
- In a certain region, earth's magnetic field points vertically down. When a plane flies due south, which wing is negatively charged?
- What are the field coils in DC motor? How are they connected with armature coil?
- Calculate Compton shift for scattering angle of 180° .
- Define work function. Write its SI unit.
- What are advantages of an electron microscope over an ordinary optical microscope?
- Why radio waves show wave nature while gamma rays do not?
- Why resonant cavity is necessary to sustain laser action?
- Can the electron in ground state of hydrogen absorb a photon of energy 13.6eV and greater than 13.6eV?

SECTION-II

Note Attempt any three questions. Each question carries equal marks:

(8x3=24)

- Define resistivity and write its unit. And derive temperature coefficient in terms of resistivity. 5
 - 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. 3
- Define motional emf. Explain how emf induced by motion of conductor across magnetic field. 5
 - A power line 10.0 m high carries a current 200A. Find the magnetic field of wire at the ground. 3
- What is meant by Rectification? Explain the action of semi conductor diode as Half-wave and Full-wave rectification. 5
 - What is the resonant frequency of a circuit, which includes a coil of inductance 2.5 H and a capacitance $40 \mu F$? 3
- Define and explain photoelectric effect. Give Einstein's explanation of photoelectric effect. 5
 - A 1.25 cm diameter cylinder is subjected to a load of 2500 kg. Calculate the stress on the bar in mega Pascal. 3
- What is laser? Write down its properties. Explain how Helium-neon laser works? 5
 - How much energy is absorbed by a man of mass 80Kg who receives a lethal whole body equivalent dose of 400 3



Roll No _____ to be filled in by the candidate

(For All Sessions)

Physics (Objective) *Rwp-12-2-23* (Group-II)

Time: 20 Minutes Marks: 17

Note: Write Answers to the Questions on the objective answer sheet provided. Four possible answers A, B, C and 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. LDR becomes necessary when op-amplifier is used as:

(A) Comparator	(B) Rectifier	(C) Inverter	(D) Night switch
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2. If velocity of body becomes equal to 'C' then its mass becomes:

(A) 0 kg	(B) $m = m_0$	(C) $m \rightarrow \infty$	(D) $m = m_0/2$
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3. Which one is low energy photon?

(A) Visible light	(B) Infrared light	(C) Ultraviolet light	(D) x-ray
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4. In Helium – Neon Laser, the percentage of Helium is:

(A) 75%	(B) 65%	(C) 60%	(D) 85%
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5. The number of neutron present in the nucleus is given by:

(A) $N = A - Z$	(B) $N = A + Z$	(C) $N = Z - A$	(D) $N = A \times Z$
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6. The binding energy per nucleon is maximum for:

(A) Radium	(B) Polonium	(C) Iron	(D) Helium
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7. Electric flux through a closed surface depends upon:

(A) Charge	(B) Medium	(C) Charge & Medium	(D) Geometry
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8. The negative of potential gradient is:

(A) Electrostatic force	(B) Electric field-intensity	(C) Potential difference	(D) Electromotive force
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9. Charge carrier in electrolyte are:

(A) Positive & negative ion	(B) Protons	(C) Electron	(D) Holes
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10. The sum of electric and magnetic force is called:

(A) Maxwell force	(B) Lorentz force	(C) Newton force	(D) Centripetal force
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11. Current passing through the coil of galvanometer is:

(A) $\frac{CN \theta}{BA}$	(B) $\frac{NAB \theta}{C}$	(C) $\frac{AN}{BC}$	(D) $\frac{C \theta}{BAN}$
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12. Induced emf can be increased by:

(A) Increase resistance of coil	(B) Decrease resistance of coil	(C) Increase number of turns	(D) Decrease magnetic flux
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13. The working principle of transformer is:

(A) Self induction	(B) Faraday Law	(C) Mutual induction	(D) Electromagnetic induction
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14. The wave form of alternating voltage is a:

(A) Sine curve	(B) Tan curve	(C) Cotangent curve	(D) Cosine curve
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15. The main advantage of use of A.C is:

(A) Minimum line losses	(B) Long distance	(C) Step up to required voltage	(D) Step up to required current
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16. Which of the following does not go plastic deformation:

(A) Copper	(B) Wrought iron	(C) Lead	(D) Glass
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17. The output voltage of rectifier is:

(A) Smooth	(B) Pulsating	(C) Perfectly direct	(D) Alternating
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R

Physics (Subjective)

(GROUP-II)

Time: 2:40 hours

SECTION-I

Rwp-12-2-23

2. Write short answers of any eight parts from the following: (8x2=16)
- What are the photo conductors?
 - Show that $v/m = N/C$.
 - Do electrons tend to go region of high potential or of low potential?

- Electric lines of force never cross why?
- Describe the change in magnetic field inside a solenoid carrying a steady current 'I'. If the number of turns is double, but length remains same?
- Why does the picture on a TV screen becomes distorted when a magnet is brought near screen?
- Why the resistance of an ammeter should be very low?
- What is Lorentz force? Give the role of electric and magnetic force in this regard.
- How can radioactivity help in the treatment of cancer?
- What do we mean by the term critical mass?
- What do you understand by "background radiation"? State two sources of radiation.
- What is the self-quencing in Geiger Muller Counter?

3. Write short answers of any eight parts from the following: (8x2=16)

- What are the difficulties in testing whether the filament of a lighted bulb obeys Ohm's Law?
- Write down the statement of Kirchoff's current rule and Kirchoff's voltage rule.
- What is meant by temperature coefficient of resistance? Give its S.I. unit.
- Draw diagram and wave shape of three phase A.C generator.
- How does doubling of frequency affect the reactance of: (a) An inductor (b) A capacitor
- In a R-L circuit, will the current lag or lead the voltage? Illustrate your answer by a vector diagram.
- Discuss the mechanism of electrical conduction by holes and electrons in a pure semi-conductor element.
- What are high temperature super conductors? Give some examples.
- Define hysteresis and draw hysteresis curve.
- Why ordinary silicon diode do not emit light?
- Draw diagram and explain working of transistor as a switch in its 'ON' state.
- Write down two characteristics of an operational amplifier.

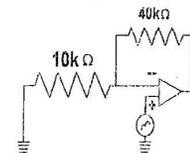
4. Write short answers of any six parts from the following: (6x2=12)

- What is electromagnetic induction?
- Does the induced emf always act to decrease the magnetic flux through a circuit?
- How would you position a flat loop of wire in a changing magnetic field so that there is no emf induced in the loop?
- The period of a pendulum is measured to be 3.0 s in the inertial reference frame of the pendulum. What is its period measured by an observer moving at a speed of 0.95 c with respect to the pendulum?
- Define Compton effect and write relation for its wavelength.
- Which has the lower energy Quanta? Radio waves or X-rays.
- Can pair production take place in vacuum? Explain.
- State postulates of Bohr's model of hydrogen atom.
- What are the advantages of lasers over ordinary light?

SECTION-II

Note Attempt any three questions. Each question carries equal marks: (8x3=24)

5. (a) Derive an expression for the energy stored in the electric field of a capacitor. 5
 (b) A platinum wire has a resistance of 10Ω at 0°C and 20Ω at 273°C . Find the volume of temperature co-efficient of resistance of this wire. 3
6. (a) Derive an expression for self induce emf i.e. $\mathcal{E} = vBL \sin \theta$. Define unit of self induction. 5
 (b) A power line 10.0 m high carries a current 200 A. Find the magnetic field of wire at the ground. 3
7. (a) Find out expression of resonance (1+4) (b) Calculate the gain of non-inverting amplifier shown in figure. 3
 resonance circuit. Also describe its properties?



8. (a) What is wave nature of particle? How this ideas was confirmed by Davison and Germer? 1+4
 (b) A wire 2.5 m long and coress section area 10^{-5}m^2 is stretched 1.5mm by a force of 100N in the elastic region calculate (i) Strain (ii) Young's modulus. 3
9. (a) Write a note on construction and working of Wilson Cloud Chamber to detect unknown radiations. 5
 (b) Calculate the longest wavelength of radiations for the Paschen Series. 3

R



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

Inter. (Part-II)-A-2022

Paper Code 8 4 7 3

Physics (Objective Type)

(For all Sessions)

Group-I

RP-9/22 Marks:17

Time: 20 Minutes

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.

1. 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
2. For higher frequency, the inductive reactance will be _____.
(A) high (B) low (C) zero (D) infinite
3. At 0 K, semiconductor is _____.
(A) conductor (B) insulator
(C) perfect insulator (D) perfect diamagnetic and paramagnetic
4. A PN junction cannot be used as _____.
(A) amplifier (B) capacitor (C) rectifier (D) light emitting diod
5. The portion of the transistor with greater concentration is _____.
(A) base (B) collector (C) emitter (D) insulator
6. The maximum energy of photo-electron depends upon _____.
(A) frequency (B) intensity (C) power (D) illumination
7. Compton shift in wavelength is zero when scattering angle of photon is _____.
(A) 30° (B) 60° (C) 0° (D) 90°
8. 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
9. The percentage of original quantity of radioactive material left after five half-lives is nearly _____.
(A) 6% (B) 5% (C) 10% (D) 3%
10. Which of the following is used as moderator is nuclear reactor?
(A) heavy water (B) boron (C) cadmium (D) aluminum
11. If the distance between charges is halved and each charge is also doubled, then the force between two changes becomes _____ times.
(A) two (B) sixteen (C) eight (D) four
12. 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
13. A thermistor with positive temperature of co-efficient is heated then its resistance will _____.
(A) decrease (B) increase (C) not be affected (D) become half
14. The magnetic force on a neutron in the magnetic field of 10 T is _____.
(A) zero (B) 1.6 x 10⁻¹⁸ N (C) 100 N (D) 1.6 x 10⁻¹⁹ N
15. A charge particle cannot be accelerated in _____ field.
(A) electric (B) gravitational (C) magnetic (D) scalar
16. 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
17. Which type of energy is stored in inductor?
(A) electric energy (B) magnetic energy (C) potential energy (D) gravitational energy

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

Inter. (Part-II)-A-2022

Physics (Essay Type)

(For All Sessions)

Time: 2:40 Hours

Group-I

Marks: 68

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

SECTION - I

R
Rwp. 91-22

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 carries 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)

☆☆☆

Roll No. 707357 to be filled in by the candidate.

Inter. (Part-II)-A-2022
(For all Sessions)

Paper Code 8 4 7 6

R

Physics (Objective Type)

Time: 20 Minutes

Rwp-A222

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.

1. Which one is not a ductile material?
(A) lead (B) copper (C) steel (D) iron
2. Open loop gain of operational amplifier is of the order of _____.
(A) 10^6 (B) 10^3 (C) 10^7 (D) 10^5
3. 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
4. All motions are _____.
(A) absolute (B) uniform (C) relative (D) variable
5. If an object moves with the speed of light, its mass will be _____.
(A) zero (B) maximum (C) infinity (D) minimum
6. Which of the following has the largest de Broglie wavelength at same speed?
(A) proton (B) α - particles (C) carbon atom (D) electron
7. The dead time of G.M tube is _____.
(A) 10^{-3} sec (B) 10^{-6} sec (C) 10^{-4} sec (D) 10^{-8} sec
8. Slow neutrons can cause fission in _____.
(A) uranium - 238 (B) uranium - 235 (C) neptunium (D) lithium
9. 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}
10. 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
11. A rheostat can be used as _____.
 (A) potential divider (B) variable resistance (C) amplifier (D) both (A) & (B)
12. Magnetic field due to current carrying straight varies as _____.
(A) $\frac{1}{r^2}$ (B) r^2 (C) $\frac{1}{r}$ (D) r
13. 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) $1.775 \times 10^{-11} \text{ C kg}^{-1}$
14. The motional emf depends upon _____.
(A) length of conductor (B) magnetic field (C) speed (D) all of these
15. Lenz's law is the manifestation of conservation of _____.
(A) current (B) voltage (C) energy (D) all of these
16. The reactance of an inductor is given as _____.
(A) ωL (B) $\frac{1}{\omega L}$ (C) $\frac{\omega}{L}$ (D) $\frac{L}{\omega}$
17. The reactance of an inductor increases with increase in _____.
 (A) frequency (B) voltage (C) resistance (D) capacitance

Roll No. to be filled in by the Candidate.

Physics (Essay Type)

Time: 2:40 Hours

Inter. (Part-II)-A-2022

(For All Sessions)

Group-II

Marks: 68

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

SECTION - I

(2 x 8 = 16)

2. Write short answers to any EIGHT questions.

- 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 x 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.

(2 x 8 = 16)

3. Write short answers to any EIGHT questions.

- 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.

(2 x 6 = 12)

4. Write short answers to any SIX questions.

- 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 $\frac{180}{\pi}$ 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)

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.

- Relation for energy density in case of an inductor is:
 - $\frac{B^2}{2\mu_0}$
 - $\frac{\mu_0}{2B^2}$
 - $\frac{B}{2\mu_0}$
 - $\frac{B}{2\mu_0^2}$
- The Lenz's law is also a statement of:
 - Law of conservation of momentum
 - Law of conservation of charge
 - Law of conservation of energy
 - Faraday's law
- Peak to Peak value of an alternating voltage is:
 - $2V_0$
 - 0
 - $\frac{V_0}{\sqrt{2}}$
 - V_0
- In RLC series resonance circuit, the condition for resonance is:
 - $X_L = X_C$
 - $X_L < X_C$
 - $X_L > X_C$
 - $X_L > Z$
- Young's modulus of lead is:
 - $1.5 \times 10^{19} \text{Nm}^{-2}$
 - $7.7 \times 10^9 \text{Nm}^{-2}$
 - $5.6 \times 10^9 \text{Nm}^{-2}$
 - $2.2 \times 10^9 \text{Nm}^{-2}$
- Number of diodes used in half wave rectifier is:
 - 4
 - 3
 - 2
 - 1
- S.I unit of current gain of transistor is:
 - Coulomb
 - Ampere
 - Farad
 - No unit
- When platinum wire is heated, it appears cherry red at:
 - 1300°C
 - 1100°C
 - 900°C
 - 500°C
- The value of Wein's constant is:
 - $2.9 \times 10^3 \text{mK}$
 - $2.9 \times 10^{-3} \text{mK}$
 - 2.9mK
 - $2.9 \times 10^{-2} \text{mK}$
- In Helium-Neon laser, the value of Helium is:
 - 85%
 - 75%
 - 65%
 - 60%
- Half life of Uranium-238 is:
 - 4.5×10^{12} years
 - 4.5×10^{11} years
 - 4.5×10^{10} years
 - 4.5×10^9 years
- The dead time of the counter is:
 - $\sim 10^{-7} \text{s}$
 - $\sim 10^{-6} \text{s}$
 - $\sim 10^{-5} \text{s}$
 - $\sim 10^{-4} \text{s}$
- Unit of electric flux is:
 - Nm^2C^{-2}
 - Nm^2C^{-1}
 - $\text{N}^{-1}\text{m}^2\text{C}^{-1}$
 - Nm^2C
- The statement $\Phi_e = \frac{1}{\epsilon_c} Q$ was given by:
 - Faraday
 - Dersted
 - Gauss
 - Coulomb
- Reciprocal of resistance is:
 - Capacitance
 - Conductance
 - Inductance
 - Resistance
- Lorentz force is given by:
 - $\vec{F} = I(\vec{L} \times \vec{B})$
 - $\vec{F} = q(\vec{V} \times \vec{B})$
 - $\vec{F} = q\vec{E} + q(\vec{V} \times \vec{B})$
 - $\vec{F} = q\vec{E}$
- A power line 10m high carries a current 200A. The magnetic field of the wire at the ground is:
 - $4 \times 10^{-6} \text{T}$
 - $40 \times 10^{-6} \text{T}$
 - $4 \times 10^{-4} \text{T}$
 - $4 \times 10^{-3} \text{T}$

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.

- i. How can you identify that which plate of a capacitor is positively charged?
- ii. Is it true that Gauss's law states that the total number of lines of force crossing a closed surface in the outward direction is proportional to the net positive charge enclosed within surface?
- iii. Give a comparison of electric and gravitational force.
- iv. Describe the process of charging of a capacitor in short.
- v. Describe the function of two sets of deflecting plates in cathode ray oscilloscope.
- vi. In an AVO meter, how can a single galvanometer perform the function of measuring current, voltage and resistance? Explain.
- vii. If a charged particle moves in a straight line through some region of space, can you say that the magnetic field in the region is zero?
- viii. How can a current loop be used to determine the presence of a magnetic field in a given region of space?
- ix. How an emf is induced in a coil placed in a constant magnetic field? (Hint: Basic principle used in electric generators).
- x. What is the significance of negative sign used in Faraday's law of magnetic induction? $\mathcal{E} = -N \frac{\Delta\phi}{\Delta t}$
- xi. In a certain region the earth's magnetic field point vertically down. When a plane flies due north, which wing tip is positively charged?
- xii. Is it possible to change both the area of the loop and the magnetic field passing through the loop and still not have an induced emf in the loop?

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

- i. Explain the term phase of A.C.
- ii. Describe a circuit which will give a continuously varying potential.
- iii. Explain the elastic constants.
- iv. How the comparison of two emfs of cells can be made?
- v. Why ordinary silicon diodes do not emit light?
- vi. Write down the characteristics of Op-amplifier.
- vii. What is meant by Retativity and Coercivity?
- viii. Why a photodiode is operated in reversed biased state?
- ix. Why does the resistance of a conductor rise with temperature?
- x. 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.
- xi. When 10V are applied to an A.C circuit, the current flowing in it is 100mA. Find its impedance.
- xii. Draw a stress strain curve for a ductile material and then define the term yield point and ultimate tensile stress.

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

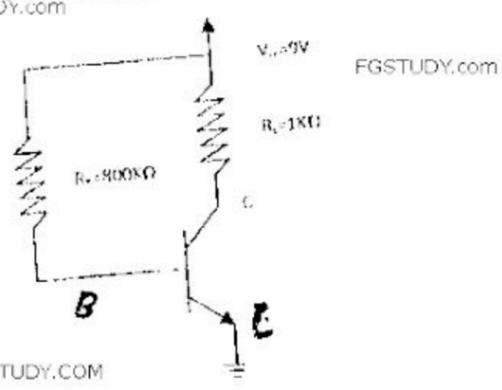
- i. What do you mean by quark?
- ii. Can pair production take place in vacuum? Explain.
- iii. What is fission chain reaction?
- iv. Define ionization energy and ionization potential.
- v. Explain why LASER action cannot occur without population inversion between atomic levels?
- vi. What do you understand by background radiation? State two sources of this radiation.
- vii. A particle which produce more ionization is less penetrating. Why?
- viii. What happens to total radiation from a black body if its absolute temperature is doubled?
- ix. Define work function and threshold frequency.

Section - II

8x3=24

NOTE: Answer any three questions from the following.

5. (a) What is Wheatstone Bridge? Give its principle, construction and working. How can it be used to determine unknown resistance? 05
- (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 volt. 03
6. (a) State and explain Ampere's Law. Calculate the magnetic field due to current carrying solenoid using Ampere's Law. 05
- (b) A solenoid has 250 turns and its self inductance is 2.4 mH. What is the flux through each turn, when the current is 2A? What is the induced emf when the current changes at 20 AS⁻¹? 03
7. (a) An alternating current is passing through R-L-C series circuit. How this circuit works as resonance circuit. Discuss frequency, current graph of this circuit. 08



- (b) In Circuit given, there is negligible potential drop between B and E. If β is 100. Calculate (i) Base current (ii) Collector current.

8. (a) Define strain energy and derive a relation for strain energy in a deformed materials. 05
- (b) A sheet of lead 5mm 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 to half of its initial value. 03
9. (a) Apply uncertainty principle to an atom in order to find that an electron can never be found inside of a nucleus and it can exist in the atom but outside the nucleus. 05
- (b) A particle of mass 5.0 mg moves with speed of 8.0 ms⁻¹. Calculate its deBroglie wavelength. 03