

Roll No. _____ to be filled in by the candidate

(For All Sessions)

Time: 20 Minutes Marks : 17

Physics (Objective) R0P-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
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2. The critical temperature of mercury is:

(A) 4.2 k	(B) 1.18 k	(C) 3.72 k	(D) 7.2 k
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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
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4. $X = A + B$ is the mathematical notation for:

(A) AND gate	(B) OR gate	(C) NOR gate	(D) NAND gate
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5. The momentum of a moving photon is:

(A) $P = h / \lambda$	(B) $P = \lambda / h$	(C) $P = hf$	(D) $P = mc^2$
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6. Pair production can take place by using:

(A) X-rays	(B) α -rays	(C) β -rays	(D) γ -rays
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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) $1.0974 \times 10^7 m$
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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
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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
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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}
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11. The S-I unit of electric flux is:

(A) Nmc^{-1}	(B) Nm^2c^{-1}	(C) Nm^2c	(D) $Nm^{-2}c^{-1}$
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12. A rheostat can be used as:

(A) Transformer	(B) Amplifier	(C) Oscillator	(D) Potential divider
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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) $\vec{F} = q\vec{E}$
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14. DMM stands for:

(A) Digital millimeter	(B) Digital multimeter	(C) Digital measuring meter	(D) Digital ammeter
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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
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16. The principle of AC generator is based on:

(A) Mutual induction	(B) Self induction	(C) Electromagnetic induction	(D) All of these
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17. The graph between A.C voltage with time is:

(A) Cosine curve	(B) Tangent curve	(C) Sine curve	(D) Cot curve
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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



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(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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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)
- i. What are the photo conductors?
 - ii. Show that $v/m = N/C$.
 - iii. Do electrons tend to go region of high potential or of low potential?

- iv. Electric lines of force never cross why?
- v. 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?
- vi. Why does the picture on a TV screen becomes distorted when a magnet is brought near screen?
- vii. Why the resistance of an ammeter should be very low?
- viii. What is Lorentz force? Give the role of electric and magnetic force in this regard.
- ix. How can radioactivity help in the treatment of cancer?
- x. What do we mean by the term critical mass?
- xi. What do you understand by "background radiation"? State two sources of radiation.
- xii. What is the self-quencing in Geiger Muller Counter?

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

- i. What are the difficulties in testing whether the filament of a lighted bulb obeys Ohm's Law?
- ii. Write down the statement of Kirchoff's current rule and Kirchoff's voltage rule.
- iii. What is meant by temperature coefficient of resistance? Give its S-I unit.
- iv. Draw diagram and wave shape of three phase A.C generator.
- v. How does doubling of 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. Discuss the mechanism of electrical conduction by holes and electrons in a pure semi-conductor element.
- viii. What are high temperature super conductors? Give some examples.
- ix. Define hysteresis and draw hysteresis curve.
- x. Why ordinary silicon diode do not emit light?
- xi. Draw diagram and explain working of transistor as a switch in its 'ON' state.
- xii. Write down two characteristics of an operational amplifier.

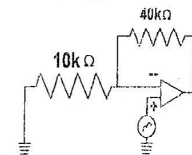
4. Write short answers of any six parts from the following: (6x2=12)

- i. What is electromagnetic induction?
- ii. Does the induced emf always act to decrease the magnetic flux through a circuit?
- iii. How would you position a flat loop of wire in a changing magnetic field so that there is no emf induced in the loop?
- iv. 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?
- v. Define Compton effect and write relation for its wavelength.
- vi. Which has the lower energy Quanta? Radio waves or X-rays.
- vii. Can pair production take place in vacuum? Explain.
- viii. State postulates of Bohr's model of hydrogen atom.
- ix. 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 frequency for the case of series resonance circuit. Also describe its properties? (1+4) (b) Calculate the gain of non-inverting amplifier shown in figure. 3



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

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