

Time: 20 Minutes**OBJECTIVE Code: 8477 GUP-1-24****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.

1. Which of the following circuit is called electrical oscillator?
 (A) R.L circuit (B) R.C circuit (C) R.L.C circuit (D) L.C circuit
2. A charged particle enters in a strong magnetic field, then its K.E
 (A) remains constant (B) increases
 (C) decreases (D) first increases then decreases
3. Turn ratio of a transformer is 50. If 220 volt A.C is applied to its primary coil, voltage in the secondary coil will be
 (A) 440 V (B) 4.4 V (C) 220 V (D) 11000 V
4. The physical quantity related to photon, that does not change in Compton scattering is
 (A) energy (B) speed (C) frequency (D) wavelength
5. In photoelectric effect, the number of photoelectrons depends upon
 (A) wavelength of light (B) intensity of light
 (C) threshold frequency (D) work function
6. Glass is also known as
 (A) solid (B) liquid (C) solid liquid (D) gas
7. The unit of electric intensity other than NC^{-1} is
 (A) V/A (B) V/m (C) V/C (D) N/V
8. The unit of \vec{E} is NC^{-1} and that of \vec{B} is $\text{NA}^{-1}\text{m}^{-1}$, then the unit of E/B is
 (A) ms^{-2} (B) ms (C) $\text{m}^{-1}\text{s}^{-1}$ (D) ms^{-1}
9. The binding energy per nucleon is maximum for
 (A) Helium (B) Iron (C) Polonium (D) Radium
10. For holography, we use a beam of
 (A) γ -rays (B) x -rays (C) β -rays (D) Laser
11. The colour of light emitted by LED depends on
 (A) its forward biasing (B) the reverse biasing
 (C) amount of forward current (D) type of semi-conductor material used
12. When current flowing through an inductor is doubled, the energy stored in it becomes
 (A) half (B) four times (C) one fourth (D) double
13. The half-life of Radon gas is
 (A) 3.8 days (B) 38 days (C) 3.8 months (D) 38 months
14. An ideal voltmeter would have
 (A) zero resistance (B) high resistance (C) infinite resistance (D) low resistance
15. A parallel plate capacitor with oil having $\epsilon_r = 2$ has a capacitance C . If the oil is removed between the plates, then capacitance of capacitor becomes
 (A) C (B) $C/2$ (C) $C/\sqrt{2}$ (D) $2C$
16. The voltage gain of an amplifier having $r_{ie} = 1\ \Omega$, $\beta = 100$ and $R_c = 20\ \Omega$ is
 (A) 2000 (B) 1000 (C) 500 (D) 5
17. When we accelerate the charge, which type of waves are produced?
 (A) Mechanical waves (B) Travelling waves
 (C) Stationary waves (D) Electromagnetic waves

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 electric field intensity. Also give its mathematical form.
- ii. Define electron volt? Relate electron volt with Joule.
- iii. The time constant of a series RC circuit is, $t = RC$. Verify that an Ohm times Farad is equal to Second.
- iv. Why the resistance of an ammeter should be very low?
- v. Electric lines of force never cross. Why?
- vi. How can you use a magnetic field to separate isotopes of chemical elements?
- vii. What do you mean by lamp-scale arrangement?
- viii. What is Lorentz force?
- ix. A particle which produces more ionization is less penetrating. Why?
- x. How can radioactivity help in the treatment of Cancer?
- xi. Differentiate between nuclear fission and nuclear fusion.
- xii. Define isotopes. Write down isotopes of Hydrogen atom.

(2 x 8 = 16)

3. Write short answers to any EIGHT questions.

- i. Describe a circuit which will give a continuously varying potential.
- ii. What is the difference between the emf and potential difference?
- iii. What is the temperature co-efficient of resistance?
- iv. How the reception of a particular radio station is selected on your radio set?
- v. What is the principle of metal detector?
- vi. Why power loss in a pure capacitance circuit is zero?
- vii. What is meant by hysteresis loss? How it is used in the construction of a transformer?
- viii. What is meant by Retentivity and Coercivity?
- ix. How can you identify tumors and inflamed tissues using 'MRI'?
- x. Why is the base current in a transistor very small?
- xi. Explain OP-AMP as a comparator.
- xii. What is the voltage gain of transistor?

(2 x 6 = 12)

4. Write short answers to any SIX questions.

- i. Name the factors upon which the self-inductance depends.
- ii. Write down the methods to improve the efficiency of a transformer.
- iii. Can a D.C. motor be turned into a D.C. generator? What changes are required to be done?

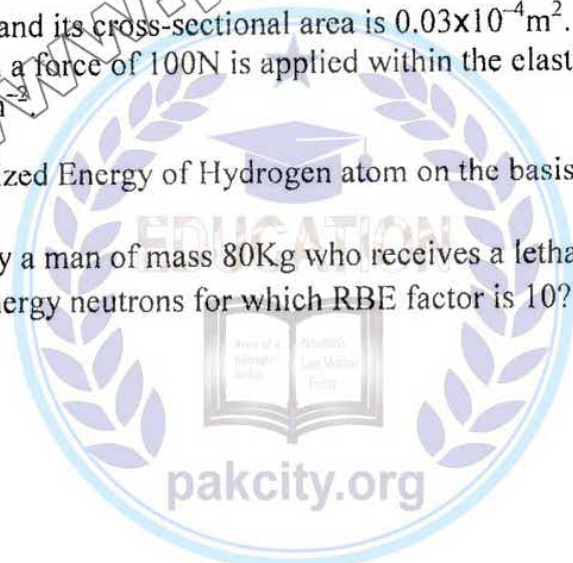
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- iv. Define work function and threshold frequency.
- v. Calculate the value of Compton wavelength of electron.
- vi. We do not notice a de-Broglie wavelength for a pitched cricket ball. Explain why?
- vii. When does light behave as a wave and when does it behave as a particle?
- viii. Describe the types of spectra and give its example.
- ix. What are advantages of laser over ordinary light?

SECTION - II.

5. (a) How did Millikan calculate the charge on an electron? Explain (5)
(b) A rectangular bar of iron is 2.0cm by 2.0cm in cross section and 40cm long. Calculate its resistance if the resistivity of iron is $11 \times 10^{-8} \Omega m$ (3)
6. (a) Define galvanometer. Explain its principle, construction and working. (5)
(b) The back emf in a motor is 120V when the motor is turning at 1680 rev per min. What is the back emf when the motor turns 3360 rev per min? (3)
7. (a) Explain Reverse Biased p-n junction and describe how depletion region increases due to Reverse Biased of p-n junction. (5)
(b) Find the value of the current flowing through a capacitor of capacitance $0.5 \mu F$, when connected to a source of 150V at 50Hz. (3)
8. (a) State and explain photoelectric effect. Write down its experimental results. (5)
(b) The length of a steel wire is 1m and its cross-sectional area is $0.03 \times 10^{-4} m^2$. Calculate the work done in stretching the wire when a force of 100N is applied within the elastic region. Young's modulus of steel is $3.0 \times 10^{11} N m^{-2}$. (3)
9. (a) Derive the expression for Quantized Energy of Hydrogen atom on the basis of Bohr's atomic model. (5)
(b) How much energy is absorbed by a man of mass 80Kg who receives a lethal whole body dose of 400 rem in the form of low energy neutrons for which RBE factor is 10? (3)

315-1stA 424-40000



Time: 20 Minutes

OBJECTIVE Code: 8476

G18-2-24

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.

1. Using spectroscopy the helium was identified in the
(A) Earth (B) Sun (C) Stars (D) all of these
2. The induced emf is primarily produced at the cost of
(A) internal energy (B) mechanical energy (C) chemical energy (D) electrical energy
3. The reactance of an inductor at 50Hz is 10Ω . Its reactance at 100Hz is
(A) 2.5Ω (B) 5Ω (C) 10Ω (D) 20Ω
4. Threshold wavelength for metal having work function 40 is λ_0 . What is the threshold wavelength for metal having work function 240 is
(A) 2λ (B) 4λ (C) $\lambda/2$ (D) $\lambda/4$
5. The emf induced in 1mH inductor in which current changes from 5A to 3A in 1s is
(A) $2 \times 10^{-6}V$ (B) $8 \times 10^{-6}V$ (C) 2V (D) 8V
6. Two metallic spheres of radius 1cm and 2cm get equal quantity of charge. Which has greater surface charge density?
(A) 1st sphere (B) 2nd sphere (C) both get equal surface (D) none of these
7. The voltage gain of an amplifier having $r_{ie} = 1\Omega$, $\beta = 100$, $R_e = 20\Omega$ is
(A) 2000 (B) 1000 (C) 500 (D) 5
8. If the length of conductor is doubled and its cross sectional area is halved, its conductance will be
(A) increased four times (B) become one fourth
(C) become one-half (D) remained un-changed
9. The capacity of condenser is 4×10^{-6} Farad and its potential is 100 Volt. The energy released on discharging it fully will be
(A) 0.02 J (B) 0.04 J (C) 0.025 J (D) 0.05 J
10. Circulation of blood can be studied by
(A) Sodium - 24 (B) Strontium - 90 (C) Carbon - 14 (D) Iodine - 131
11. If a wire is stretched to double of its length then strain will be
(A) zero (B) 1 (C) $1/2$ (D) double
12. Unit of decay constant λ is
(A) ms (B) m^{-1} (C) m (D) s^{-1}
13. The term transistor stands for
(A) transfer of resistance (B) transfer of voltage
(C) transfer of current (D) all of these
14. Force on a current carrying conductor per unit length is given by
(A) $IL \sin\theta$ (B) ILB (C) IB (D) $IB \sin\theta$
15. For a current carrying solenoid the term "n" has unit as
(A) no unit (B) m (C) m^{-1} (D) m^{-2}
16. When applied potential difference is increased; capacitance of parallel plate capacitor
(A) increases (B) decreases (C) remains same (D) reduces to zero
17. In photoelectric effect the intensity of light made twice than initial value. The maximum K.E of photoelectron becomes
(A) same (B) double (C) half (D) four times

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

SECTION – I

2. Write short answers to any EIGHT questions.

(2 × 8 = 16)

- i. Suppose you follow an electric field line due to a positive point charge. Do electric field and the potential increase or decrease.
- ii. Describe the force or forces on a positive point charge when placed between parallel plates.
 - a) with similar and equal charges
 - b) with opposite and equal charges
- iii. State Gauss's Law. Write down its mathematical form.
- iv. Define dielectric constant. Give its mathematical form.
- 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. Why the voltmeter should have a very high resistance.
- vii. A sensitive galvanometer cannot be stable. Why?
- viii. What should be the orientation of current carrying coil in a magnetic field so that torque acting on it is
 - a) maximum
 - b) minimum
- ix. If a nucleus has a half life of 1 year, does this mean that it will be completely decayed after 2 years? Explain.
- x. What fraction of a radioactive sample decays after two half lives have elapsed?
- xi. What are baryons and mesons? How are they formed?
- xii. Describe principle and working of Mass Spectrograph.

3. Write short answers to any EIGHT questions.

(2 × 8 = 16)

- i. Describe a circuit which will give continuously varying potential.
- ii. Explain why the terminal potential difference of a battery decreases when the current drawn from it is increased.
- iii. Distinguish between resistance and resistivity. Give units.
- iv. How does doubling the frequency effect the resistance of an (a) Inductor (b) Capacitor
- v. What is meant by A.M and F.M?
- vi. Give four characteristics of series resonance circuit.
- vii. What are Para and ferromagnetic substances? Give example.
- viii. What is meant by Hysteresis loss? How is it used in the construction of a transformer?
- ix. What are applications of Superconductors?
- x. Why ordinary silicon diodes do not emit light?
- xi. Why a photodiode is operated in reverse biased state?
- xii. What are the characteristics of operation amplifier?

4. Write short answers to any SIX questions.

(2 × 6 = 12)

- i. Does the induced emf always act to decrease the magnetic flux through a circuit?
- 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. How the "Eddy Currents" are produced? What are their effects on the efficiency of a transformer?
- iv. As a solid is heated and begins to glow, why does it first appear red?

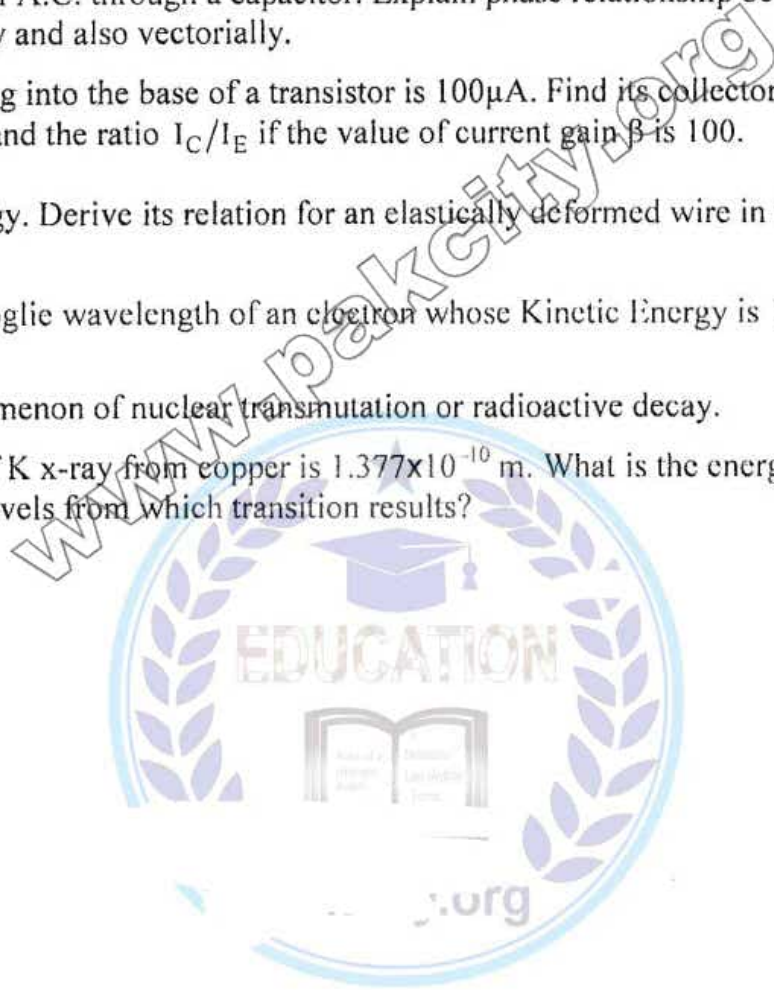
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- v. Can pair production take place in vacuum? Explain.
- vi. Find the relativistic mass of an object moving with speed $0.8C$, where 'C' is the speed of light.
- vii. Write down at least four applications of a photocell.
- viii. What are the advantages of laser over ordinary light?
- ix. Write down any two postulates of Bohr's theory of Hydrogen atom.

SECTION – II

- 5. (a) Find the charge on an electron by Millikan's method. (5)
(b) A rectangular bar of iron is 2.0cm by 2.0cm in cross-section and 40cm long. Calculate the resistance, if the resistivity of iron is $11 \times 10^{-8} \Omega m$ (3)
- 6. (a) Discuss the principle, construction and working of a Galvanometer. (5)
(b) A square coil of side 16cm has 200 turns and rotates in a uniform magnetic field of magnitude 0.05T. If the peak emf is 12V, what is the angular velocity of the coil? (3)
- 7. (a) Discuss the flow of A.C. through a capacitor. Explain phase relationship between current and voltage graphically and also vectorially. (5)
(b) The current flowing into the base of a transistor is $100 \mu A$. Find its collector current I_C , its emitter current I_E and the ratio I_C/I_E if the value of current gain β is 100. (3)
- 8. (a) Define strain energy. Derive its relation for an elastically deformed wire in terms of modulus of elasticity. (5)
(b) What is the de-Broglie wavelength of an electron whose Kinetic Energy is 120eV? (3)
- 9. (a) Explain the phenomenon of nuclear transmutation or radioactive decay. (5)
(b) The wavelength of K x-ray from copper is $1.377 \times 10^{-10} m$. What is the energy difference between the two levels from which transition results? (3)

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- Grj-12-1-23
- The orbital electron has
(A) fixed energy (B) 3.4 eV energy
(C) any amount of energy (D) infinite energy
 - The circuit used for smoothing the pulsating voltage is called
(A) resistor (B) filter (C) rectifier (D) grid
 - In reaction ${}^2_1\text{H} + {}^3_1\text{H} \rightarrow {}^4_2\text{He} + \text{X} + 17.6 \text{ MeV}$, X will be
(A) proton (B) electron (C) neutron (D) α particle
 - In reverse biased PN junction, its resistance is
(A) several mega ohms (B) zero (C) infinite (D) few ohms
 - The radiations which are not deflected by magnetic field are
(A) β -rays (B) α -rays (C) γ -rays (D) cathode rays
 - Addition of impurity of 3rd group in the semiconductor causes the production of
(A) holes (B) protons (C) electrons (D) positron
 - The materialization of energy takes place in the process of
(A) Photoelectric effect (B) Compton's effect (C) Pair production (D) Pair annihilation
 - Work done by magnetic force is
(A) $Fd\cos\theta$ (B) positive (C) negative (D) zero
 - The factor $\frac{h}{m_0c^2}$ has the unit of
(A) second square (B) second (C) J.S. (D) JS^{-1}
 - By increasing the length of current carrying solenoid, the magnetic field will
(A) increase (B) decrease (C) not change (D) be uniform
 - At high frequency, the current in pure inductor is
(A) low (B) high (C) moderate (D) zero
 - Semiconductor diode is an example of
(A) super conductor (B) ohmic device (C) non ohmic device (D) ferromagnetic
 - If the frequency of A.C. is doubled then capacitive reactance will be
(A) half (B) two times (C) four times (D) one fourth
 - $\frac{\Delta v}{\Delta r}$ has the unit of
(A) electric flux (B) magnetic flux (C) magnetic field (D) electric field
 - The windings of electromagnetic in generator are called
(A) primary coils (B) field coils (C) secondary coils (D) inductors
 - Gaussian surface should be
(A) spherical (B) cubical (C) circular (D) close
 - The expression for energy stored in an inductor is
(A) $\frac{1}{2}L^2I$ (B) L^2I (C) $\frac{1}{2}LI^2$ (D) LI^2

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

SECTION – I

2. Write short answers to any EIGHT questions.

(2 x 8 = 16)

- What is meant by time constant?
- What is the effect of dielectric medium on electrical force, when it is placed between two point charges?
- How can you identify that which plate of a capacitor is positively charged?
- If a point charge 'q' of mass 'm' is released in a non-uniform electric field with field pointing in the same direction, will it make a rectilinear motion?
- State the Lenz's law and write its expression.
- How can a current loop be used to determine the presence of a magnetic field in a given region of space?
- What should be the orientation of a current carrying coil in a magnetic field so that the torque acting upon the coil is: (i) maximum (ii) minimum
- Is it possible to orient a current loop in a uniform magnetic field such that the loop will not tend to rotate? Explain.
- Describe a brief account of interaction of various types of radiations with matter.
- How can radioactivity help in the treatment of cancer?
- Write down nuclear reactions occur in the sun.
- What is meant by half-life, also write down the relation, which exists between decay constant and half-life?

3. Write short answers to any EIGHT questions.

(2 x 8 = 16)

- Explain why the terminal potential difference of a battery decreases when the current drawn from it is increased?
- Under what conditions the terminal potential difference of a battery is (a) equal (b) less than, the emf of the battery.
- A potential difference is applied across the ends of a copper wire. What is the effect on the drift velocity of electrons by decreasing the length and temperature of the wires?
- In R-L circuit, will the current lag or lead the voltage? Illustrate your answer by a vector diagram.
- What is the three phase A.C. supply? Write down its two uses.
- A sinusoidal current has rms value of 10A. What is the peak value of sinusoidal current?
- Describe briefly the feature "coercivity" of magnetic material in the study of hysteresis loop.
- Distinguish between Intrinsic and Extrinsic semiconductors.
- What is "Domains" region which exists in ferromagnetic material?
- What is the net charge on a n-type or p-type substance? Explain.
- Write down four uses of operational amplifier.
- Why a photo diode is operated in reverse biased state?

4. Write short answers to any SIX questions.

(2 x 6 = 12)

- When an electric motor, such as electric drill, is being used, does it also act as a generator? If so, what is the consequence of this?
- Can a step-up transformer increase the power level?
- In a transformer, there is no transfer of charge from the primary to the secondary. How is, then the power transfer?
- As a solid is heated and begins to glow, why does it first appear red?
- Will higher frequency light eject greater number of electrons than low frequency light?
- When a light shines on a surface, is momentum transferred to the metal surface?

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- vii. Explain wave-particle duality.
- viii. Write down two uses of x-rays.
- ix. Explain, how line spectrum can be used for the identification of elements?

(SECTION - II)

Note: Attempt any three (3) questions.

5. (a) Derive the relation for energy stored in a capacitor in terms of electric field intensity. (5)
- (b) A rectangular bar of iron is 2.0 cm by 2.0 cm in cross section and 40 cm long. Calculate the resistance if the resistivity of iron is $11 \times 10^{-8} \Omega\text{m}$. (3)
6. (a) Define Motional EMF and derive its relation. (5)
- (b) A coil of $0.1\text{m} \times 0.1\text{m}$ and of 200 turns carrying a current of 1.0 mA is placed in a uniform magnetic field of 0.1 T. Calculate the maximum torque that acts on the coil. (3)
7. (a) What is RLC parallel circuit? Find its impedance diagram and resonance frequency. (5)
- Give its two properties.
- (b) The current flowing into the base of transistor is $100 \mu\text{A}$. Find its collector current I_c , its emitter current I_E and the ratio $\frac{I_c}{I_E}$. The value of current gain β is 100. (3)
8. (a) What is meant by strain energy? Derive the relation for strain energy in a deformed material. (5)
- (b) What is the mass of a 70 kg man in a space traveling at 0.8 c from us to measure from Earth? (3)
9. (a) Define laser. Explain laser operation. Give some uses of laser. (5)
- (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. (3)
- Calculate (a) The absorbed energy in joules (b) equivalent dose in rem.

314-1stA 423-34000



Roll No. of Candidate : _____

PHYSICS

Intermediate Part-II , Class 12th (1stA 423 - II) Paper: II Group – II

Time: 20 Minutes

OBJECTIVE Code: 8474 374-12-2-23 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.

1. Most penetrating among the followings are
(A) Alpha rays (B) Beta rays (C) Neutrons (D) Gamma rays
2. Switching time of a photo diode is in
(A) 10^{-9} s (B) 10^{-4} s (C) 10^{-6} s (D) 10^{-15} s
3. Most stable isotope among the followings is
(A) Fe^{58} (B) U^{235} (C) Pu^{239} (D) Pb^{82}
4. The diode in a half wave rectifier conducts for _____ during a complete AC cycle.
(A) 90° (B) 180° (C) 360° (D) 45°
5. For lyman series, longest wavelength is emitted when $n =$ _____
(A) 1 (B) 2 (C) ∞ (D) 5
6. Highest occupied band in solids is _____ band.
(A) conduction (B) forbidden (C) core (D) valence
7. Wavelength of radiations emitted from a thermal object depends only on
(A) temperature (B) colour of surface (C) size of surface (D) nature of surface
8. When plane of coil is placed parallel to magnetic field, torque on it is
(A) zero (B) maximum (C) intermediate (D) infinite
9. No inertial frame of reference is preferred over another inertial frame
(A) false (B) true
(C) true for static frames (D) true for dynamic frames
10. When a solenoid containing steady current is gently pressed, magnetic field inside it,
(A) increases (B) decreases (C) vanishes (D) remains same
11. _____ charges produce electromagnetic waves.
(A) static (B) steadily moving (C) heavy (D) oscillating
12. Velocity of free electrons in metals at room temperature is of the order of
(A) 10^5 m/s (B) 10^8 m/s (C) 10^3 m/s (D) 10^{-3} m/s
13. In a capacitor, voltage _____ current by _____.
(A) lags, π (B) leads, $\pi/2$ (C) lags, $\pi/2$ (D) leads, π
14. Inside a charged metallic box, electric field intensity is
(A) zero (B) strong (C) weak (D) variable
15. _____ uses a transformer with many secondary coils
(A) TV receiver (B) door bell (C) Transistor radio (D) AC generator
16. When applied potential difference is increased; capacitance of parallel plate capacitor
(A) increases (B) decreases (C) remains same (D) reduces to zero
17. Average output power of an AC generator for resistive load is _____ if peak current and voltage are I_0 & V_0 respectively
(A) $V_0 I_0$ (B) $\frac{V_0 I_0}{2}$ (C) zero (D) $2 V_0 I_0$

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

SECTION – I

Q.1 - 12-2-23

2. Write short answers to any EIGHT questions.

(2 x 8 = 16)

- The potential is constant throughout a given region of space. Is the electrical field zero or non-zero in this region?
- Describe the force or forces on a positive charged particle when placed between two parallel plates with similar and equal charges.
- Distinguish between conductor and photo-conductor.
- How does a capacitor work in an electrical circuit?
- 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?
- A loop of wire is suspended between the poles of a magnet with its plane parallel to the pole faces. What happens if a direct current is put through the coil? What happens if an alternating current is used instead?
- How does the beam of electrons is focused and deflected in CRO?
- Differentiate between stable and sensitive galvanometer.
- Write down two interactions of matter with energy.
- If you swallowed an alpha-particle source and β - source which would be the more dangerous to you? Explain.
- Explain the working of control rods in nuclear reactor.
- For what purpose alcohol or bromine is mixed with principal gas in GM-tube?

3. Write short answers to any EIGHT questions.

(2 x 8 = 16)

- Describe a circuit which will give continuously varying potential.
- How does doubling the frequency affect the reactance of capacitor?
- What is para substance? Give example.
- Why ordinary silicon diodes do not emit light?
- Why photodiode is operated in reverse biased state?
- Explain the conditions under which electromagnetic waves are produced from the source?
- Define the term (i) Elastic limit (ii) Ultimate tensile stress from stress strain curve.
- Explain why the terminal potential difference of battery decreases when current drawn from it, is increased?
- What do you mean by tolerance with reference to carbon resistor?
- What is power factor in A.C. circuit? Explain.
- Energy dissipated per cycle is more for steel as compared to iron. Why?
- Give two characteristics of op-amplifier.

4. Write short answers to any SIX questions.

(2 x 6 = 12)

- Does the induced emf in a circuit depends on the resistance of the circuit?
- Show that ϵ and $\frac{\Delta\phi}{\Delta t}$ have the same unit.
- Can a step-up transformer increase the power level?
- What do you understand by work function?

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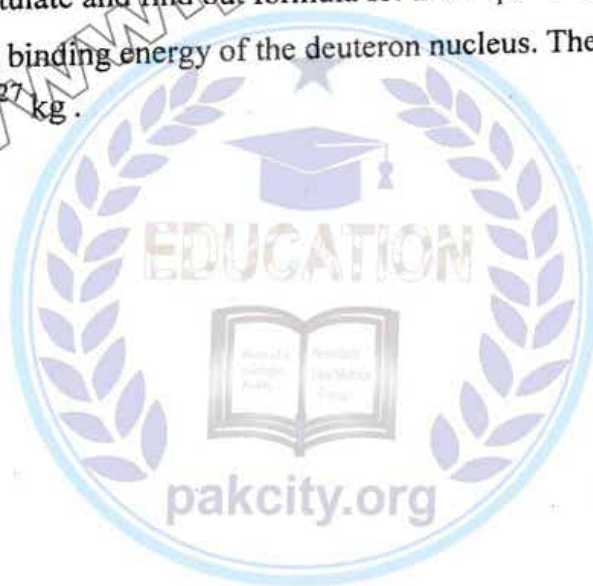
- v. As a solid is heated and begins to glow, why does it first appear red?
- vi. Which photon, red, green or blue carries the most (a) energy and (b) momentum?
- vii. When light shines on a surface, is momentum transferred to the metal surface?
- viii. What is meant by line spectrum? Explain line spectrum can be used for the identification of element.
- ix. Can the electron in the ground state of hydrogen absorb a photon of energy 13.6 eV and greater than 13.6 eV?

SECTION - II

Note: Attempt any three (3) questions.

5. (a) Define absolute P.E and derive expression of absolute potential due to a point charge. (5)
 (b) Resistance of an iron wire at 0°C is $1 \times 10^4 \text{ ohm}$. What is the resistance at 500°C if temperature co-efficient of resistance of iron is $5.2 \times 10^{-3} \text{ K}^{-1}$. (3)
6. (a) Derive an expression for torque on current carrying coil in uniform magnetic field. (5)
 (b) The back emf in a motor is 120V when the motor is turning at 1680 rev/min. What is the back emf when the motor turns 3360 rev/min? (3)
7. (a) What is operational amplifier? How does it work as inverting amplifier and also find its gain? (5)
 (b) Find the value of current and inductive reactance when A.C. voltage of 220 V at 50 Hz is passed through an inductor of 10 H. (3)
8. (a) Define intrinsic and extrinsic semiconductor. How N-type and P-type substances are formed? (5)
 (b) What is the maximum wavelength of the two photons produced when a positron annihilates an electron? The rest mass energy of each particle is 0.51 MeV. (3)
9. (a) Write Bohr's second postulate and find out formula for Bohr quantized radii. (5)
 (b) Find the mass defect and binding energy of the deuteron nucleus. The experimental mass of deuteron is $3.3435 \times 10^{-27} \text{ kg}$. (3)

315-1stA 423-34000



Time: 20 Minutes

OBJECTIVE Code: 8474 *cut-4-22* 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.

- Which of the following electromagnetic waves have the shortest wavelength?
(A) radio waves (B) infrared waves (C) ultraviolet waves (D) micro waves
- Automatic function of street lights can be done by _____.
(A) inductor (B) comparator (C) transistor (D) capacitor
- A two input NAND gate with input 'A' and 'B' has output zero if _____.
(A) B is zero (B) A is zero
(C) both A and B inputs are zero (D) both inputs A and B are one
- The shortest wavelength in Lyman series is _____.
(A) $\frac{2}{3}R_H$ (B) $\frac{4}{9}R_H$ (C) $\frac{1}{R_H}$ (D) R_H
- The potential difference between two plates is 100 volts and separation of the plates 5 cm then potential gradient is _____.
(A) 2000 NC^{-1} (B) 20 NC^{-1} (C) 5000 NC^{-1} (D) 2 NC^{-1}
- If the temperature of the black body is doubled then energy radiated per second per unit area becomes.
(A) 32 times (B) 16 times (C) 64 times (D) 4 times
- In radiation therapy, the thyroid cancer treatment is done with _____.
(A) sodium - 24 (B) iodine - 131 (C) carbon - 14 (D) cobalt - 60
- A direct current of 5 ampere is given to primary coil, then the voltage developed across secondary coil is _____.
(A) 5 volts (B) zero (C) 10 volts (D) 2 volts
- A battery moves a charge of 400 C in a circuit in time 50 seconds. The current will be _____.
(A) 2 A (B) 8 A (C) 20 A (D) 200 A
- Which of the following is not needed in fast nuclear reactor?
(A) moderator (B) control rods (C) turbine (D) heat exchanger
- Which of the following is not present in A.C generator?
(A) split rings (B) carbon brushes (C) magnetic field (D) armature
- Which of the following is not accurate measuring device?
(A) digital multimeter (B) cathode rays oscilloscope (C) voltmeter (D) potentiometer
- A one farad capacitor is charged to 100 V and then discharge through $1 \text{ K}\Omega$ resistance the total energy dissipated through resistor is _____.
(A) 5 KJ (B) 10 KJ (C) 2 KJ (D) 100 KJ
- The length contraction happens only _____.
(A) perpendicular to direction of motion (B) along the direction of motion
(C) opposite to direction of motion (D) along any direction
- In RLC series circuit, at resonance frequency, the impedance is _____.
(A) zero (B) minimum (C) maximum (D) infinite
- Which one of the following is not semiconductor?
(A) germanium (B) silicon (C) aluminium (D) gallium arsenide
- The magnetic force on an electron moving with speed 10^6 m/sec perpendicular to the magnetic field of strength 1 web m^{-2} is _____.
(A) $1.6 \times 10^{-19} \text{ N}$ (B) $1.6 \times 10^{-13} \text{ N}$ (C) zero (D) $1.6 \times 10^{-23} \text{ N}$

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Time: 20 Minutes**OBJECTIVE** **Code: 8473** **445-422** **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. To construct a step down transformer _____.
(A) $N_S > N_P$ (B) $N_S = N_P$ (C) $N_S < N_P$ (D) $N_S = 10 N_P$
2. The inputs of NAND gate are '1' and '0'. Its output will be _____.
(A) 0 (B) 2 (C) 0.5 (D) 1
3. SI unit of current amplification factor ' β ' is _____.
(A) ampere (B) AS^{-1} (C) no unit (D) CS^{-1}
4. Lyman series lies in the _____.
(A) ultraviolet region (B) visible region (C) infrared region (D) far-infrared region
5. Practical application of electrostatic force is in _____.
(A) laser (B) x-ray production (C) inkjet printer (D) A.C generator
6. Which of the following has the greatest frequency?
(A) radio wave (B) gamma-ray (C) x-ray (D) red light
7. Two down and one up quark make _____.
(A) neutron (B) photon (C) positron (D) proton
8. The unit of magnetic flux density is _____.
(A) $Wb m^{-2}$ (B) $Nm^{-1}A^{-1}$ (C) tesla (D) all of these
9. Magnitude of drift velocity is of the order of _____.
(A) $10^{-6} mS^{-1}$ (B) $10^6 mS^{-1}$ (C) $10^3 mS^{-1}$ (D) $10^{-3} mS^{-1}$
10. The half life of radon gas is _____.
(A) 4.5×10^9 years (B) 30.1 years (C) 3.8 days (D) 23.5 minutes
11. The device which allows only the continuous flow of A.C through it is _____.
(A) capacitor (B) inductor (C) thermistor (D) all of these
12. A cell is used in _____.
(A) ohmmeter (B) ammeter (C) galvanometer (D) voltmeter
13. A charge of four coulombs is in the electric field intensity of $4 N/C$. The force on the charge is _____.
(A) 8 N (B) 16 N (C) 1 N (D) zero
14. Which one is low energy photon?
(A) x-ray (B) infrared light (C) ultraviolet light (D) visible light
15. The peak value of A.C source is 20 A, then its rms value will be _____.
(A) 10 A (B) 14.1 A (C) 20 A (D) 28.2 A
16. If a body regains completely its altered shape and size, it is said to be _____.
(A) plastic (B) brittle (C) elastic (D) all of these
17. The magnetic field of solenoid is quite similar to that of _____.
(A) straight conductor (B) single wire loop (C) a bar magnet (D) all of these

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

SECTION - I

2. Write short answers to any EIGHT questions.

(2 x 8 = 16)

- Define electron volt (ev). Show that $1 \text{ ev} = 1.6 \times 10^{-19} \text{ J}$.
- Show that $\frac{1 \text{ volt}}{1 \text{ meter}} = \frac{1 \text{ newton}}{1 \text{ coulomb}}$.
- Is \vec{E} necessarily zero inside a charged rubber balloon, if balloon is spherical? Assume that charge is uniformly distributed over the surface.
- Prove that ohm x farad = second.
- How can a galvanometer is made more sensitive? Explain briefly.
- 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 ?
- Draw a circuit diagram of current measuring part of avometer.
- Is it possible to orient a current loop in a uniform magnetic field such that the loop will not tend to rotate? Explain.
- What do you understand by back ground radiations? State any two sources of radiation.
- How can radioactivity help in the treatment of cancer?
- Differentiate between mass defect and binding energy.
- Define nuclear fission and nuclear fusion.

(2 x 8 = 16)

3. Write short answers to any EIGHT questions.

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

(2 x 6 = 12)

4. Write short answers to any SIX questions.

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

SECTION - II

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

- (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)
- (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)
- (a) What is comparator circuit? How can it be used as a night switch? (5)

(b) A 10 mH, 20 Ω coil is connected across 240 v and $\frac{180}{\pi}$ Hz source. How much power does it dissipate? (3)
- (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)
- (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)

Roll No. of Candidate: _____

GUT-G1-12-19

Physics (New Scheme)

(INTER PART-II) 419-(I)

Group: I

Paper: II

Time: 20 Minutes

OBJECTIVE

Marks: 17

Code: 8471

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 other blank.

- Due to polarization, electric field E in a capacitor:
(A) increases (B) decreases
(C) first increases then decreases (D) remains same
- If time constant in RC circuit is small, then capacitor is charged or discharged:
(A) slowly (B) rapidly (C) at constant rate (D) intermittently
- Kirchhoff's second rule is based on:
(A) law of conservation of energy (B) law of conservation of mass
(C) law of conservation of charge (D) law of conservation of momentum
- S.I unit of magnetic permeability is:
(A) $\text{Wb A}^{-1}\text{m}^{-1}$ (B) Wb m^2 (C) Wb mA^{-1} (D) Wb Am^{-1}
- When ohmmeter gives full scale deflection, it indicates,
(A) zero resistance (B) infinite resistance (C) small resistance (D) very high resistance
- Lenz's law deals with the:
(A) magnitude of induced current (B) direction of induced emf
(C) direction of induced current (D) magnitude of induced emf
- When current flowing through an inductor is doubled, then energy stored in it becomes:
(A) half (B) four times (C) one fourth (D) double
- In a capacitive circuit of A.C quantity, when $q = 0$, the slope of $q - t$ curve is:
(A) minimum (B) maximum (C) zero (D) negative
- When A.C passes through an inductor, voltage leads the current by an angle:
(A) 0° (B) 45° (C) 90° (D) 180°
- In extrinsic semi-conductors, doping is of the order of:
(A) 1 atom to 10^4 (B) 1 atom to 10^8 (C) 1 atom to 10^{16} (D) 1 atom to 10^6
- The Boolean equation for exclusive NOR gate is given by:
(A) $X = A.B + B.A$ (B) $X = A.\bar{B} + \bar{B}.A$ (C) $X = A.\bar{B} + \bar{A}.B$ (D) $X = A.\bar{B} + \bar{B}.A$
- The potential barrier for silicon at room-temperature is
(A) 0.7 volt (B) 0.5 volt (C) 0.3 volt (D) 0.9 volt
- The unit of work function is:
(A) volt (B) joule (C) watt (D) farad
- An electron in H-atom is excited from ground state to $n = 4$, how many spectral lines are possible in this case?
(A) 3 (B) 4 (C) 5 (D) 6
- Metastable state is _____ than normal excited state.
(A) 10^{-5} times larger (B) 10^{-8} times smaller (C) 10^{-3} times smaller (D) 10^5 times larger
- A pair of quark and antiquark make a:
(A) meson (B) hadron (C) lepton (D) baryon
- The force which is responsible for the breaking up of the radioactive elements is:
(A) strong nuclear force (B) gravitational force
(C) electromagnetic force (D) weak nuclear force

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

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

- i. Write any two properties of electric field lines.
- ii. Differentiate between electric potential and electric potential difference.
- iii. Describe the force or forces on a positive point charge when placed between parallel plates with similar and equal charges.
- iv. A particle having a charge of 20 electrons on it falls through a potential difference of 100 V. calculate the energy acquired by it in electron volts (eV).
- v. What is the function of grid in case of cathode ray oscilloscope?
- vi. How can you prefer potentiometer over voltmeter?
- vii. Why does the picture on a TV screen become distorted when a magnet is brought near the screen?
- viii. A plane conducting loop is located in a uniform magnetic field that is directed along the x-axis. For what orientation of the loop is the flux a maximum? For what orientation is the flux a minimum?
- ix. A metal rod of length 25 cm is moving at a speed of 0.5 ms^{-1} in a direction perpendicular to a 0.25 T magnetic field. Find the emf produced in the rod.
- x. State Lenz's Law and write its formula.
- xi. How would you position a flat loop of wire in a changing magnetic field so that there is no emf induced in the loop?
- xii. Four unmarked wires emerge from a transformer. What steps would you take to determine the turns ratio?

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

- i. Do bends in a wire affect its electrical resistance? Explain.
- ii. Define wheatstone bridge. Draw its circuit diagram.
- iii. Distinguish between emf and terminal potential.
- iv. Write the advantages and disadvantages of FM over AM.
- v. A sinusoidal current has rms value of 10 A. What is the maximum or peak value?
- vi. How does doubling the frequency affect the reactance of
 - a) An inductor
 - b) A capacitor
- vii. Distinguish between elastic deformation and plastic deformation.
- viii. Define stress and strain. What are their units?
- ix. What is meant by strain energy? Write its formula.
- x. How does the motion of an electron in an n-type substance differ from the motion of holes in a p-type substance?
- xi. Why is the base current in a transistor very small?
- xii. What is meant by a current gain of a transistor? Write its formula.

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

- i. If the speed of light were infinite, what would the equations of special theory of relativity reduce to.
- ii. Can pair production take place in vacuum? Explain.
- iii. What are black body radiations?
- iv. Bohr's theory of hydrogen atom is based upon several assumptions. Do any of these assumptions contradict classical physics?
- v. Explain why laser action cannot occur without population inversion between atomic levels?
- vi. What are isotopes? What do they have in common and what are their differences?
- vii. How can radioactivity help in the treatment of cancer?
- viii. Define mass defect and binding energy.
- ix. What are leptons? Give an example.

(Turn Over)

- 2 -

(SECTION - II)

5. (a) Define electric potential. Calculate the electric potential at the point due a point charge. 4+1
- (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 of iron is $5.2 \times 10^{-3} \text{K}^{-1}$? 3
6. (a) State Ampere's law. Apply it to calculate the magnetic field due to current flowing through a solenoid. 5
- (b) A coil of 10 turns and 35cm^2 area is in a perpendicular magnetic field of 0.5T. The coil is pulled out of the field in 1.0s. Find the induced emf in the coil as it is pulled out of the field. 3
7. (a) Describe and explain the principle of generation, transmission and reception of electromagnetic waves. 5
- (b) The current flowing into the base of a transistor is $100\mu\text{A}$. 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. 3
8. (a) Define modulus of elasticity. Discuss its different types. Also give stress-strain curve of elastic limit and yield strength. 5
- (b) Find the mass of a moving object with speed $0.8c$. 3
9. (a) What is inner shell transition? Explain the production of x-rays. 1+4
- (b) Find the mass defect and the binding energy for tritium, if the atomic mass of tritium is 3.016049u . 3

317-419-27000



Roll No. of Candidate: _____

Physics (New Scheme)

(INTER PART-II) 419-(I)

Group: II

Paper: II

Time: 20 Minutes

OBJECTIVE

Marks: 17

Code: 8472

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 other blank.

1. Selenium is a
 - A) conductor
 - B) insulator
 - C) photoconductor
 - D) semi-conductor
2. The electron volt (eV) is the unit of
 - A) electric current
 - B) electric energy
 - C) electric potential
 - D) electric flux
3. The drift velocity of electrons is of the order of
 - A) 10^{-2} m/s
 - B) 10^{-3} m/s
 - C) 10^3 m/s
 - D) 10^6 m/s
4. If a charge is at rest in a magnetic field then the force on charge is
 - A) $q(\vec{V} \times \vec{B})$
 - B) $q V B \sin\theta$
 - C) $q V B$
 - D) zero
5. The SI unit of magnetic induction is
 - A) weber
 - B) henry
 - C) tesla
 - D) gauss
6. Emf is induced due to change in
 - A) electric flux
 - B) magnetic flux
 - C) electric potential
 - D) electric current
7. Mutual induction has a practical role in the performance of the
 - A) motor
 - B) generator
 - C) choke
 - D) transformer
8. In RLC series circuit, the current at resonance frequency is
 - A) minimum
 - B) maximum
 - C) zero
 - D) infinite
9. At high frequency, the value of reactance of capacitor will be
 - A) large
 - B) small
 - C) zero
 - D) infinite
10. Which one of the following is a polymeric solid
 - A) glass
 - B) nylon
 - C) copper
 - D) zinc
11. In P-type substances, the minority charge carriers are
 - A) holes
 - B) protons
 - C) electrons
 - D) neutrons
12. The output resistance of an operational amplifier is
 - A) high
 - B) low
 - C) zero
 - D) equal to input resistance
13. Wave nature of light appears in
 - A) pair production
 - B) Compton effect
 - C) photoelectric effect
 - D) interference
14. The unit of Planck's constant is
 - A) Volt
 - B) JS
 - C) JS^{-1}
 - D) eV
15. Balmer series lies in the region of electromagnetic spectrum
 - A) infra-red
 - B) visible
 - C) ultraviolet
 - D) far infrared
16. The S.I unit of radiation dose is
 - A) roentgen
 - B) curie
 - C) grey
 - D) rem
17. The binding energy per nucleon is maximum for
 - A) uranium
 - B) platinum
 - C) hydrogen
 - D) iron

(SECTION - I)

2. Write short answers to any EIGHT questions.

(2 × 8 = 16)

- i. 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 rectilinear motion.
- ii. Electric lines of force never cross; why?
- iii. Prove that: $E = -\frac{\Delta V}{\Delta r}$
- iv. Find electric intensity of field inside a hollow charged sphere.
- v. Why the voltmeter should have a very high resistance?
- vi. How can you use a magnetic field to separate isotopes of chemical element?
- vii. How can we increase the sensitivity of galvanometer?
- viii. What is the function of 'X' and 'Y' plates in C.R.O?
- ix. Can an electric motor be used to drive an electric generator with the output from the generator being used to operate the motor?
- x. How would you position a flat loop of wire in a changing magnetic field so that there is no emf induced in the loop?
- xi. What is the function of the commutator in D.C motor?
- xii. Discuss the relation: $V = \varepsilon + IR$

3. Write short answers to any EIGHT questions.

(2 × 8 = 16)

- i. Define Kirchhoff's Second Rule.
- ii. Why does the resistance of a conductor rise with temperature?
- 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. At what frequency will an inductor of 1.0 H have a reactance of 500 Ω ?
- v. Explain the conditions under which electromagnetic waves are produced from a source.
- vi. In a R-L circuit, will the current lag on lead the voltage? Illustrate your answer by a vector diagram.
- vii. What is meant by paramagnetic and diamagnetic substances? Give example for each.
- viii. What is meant by hysteresis loss? How is it used in the construction of a transformer?
- ix. Define intrinsic and extrinsic semiconductor.
- x. How gates are used in controlling systems?
- xi. Why ordinary silicon diodes do not emit light?
- xii. What is the net charge on an n-type or a p-type substance?

4. Write short answers to any SIX questions.

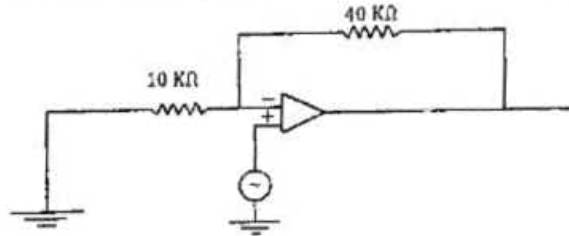
(2 × 6 = 12)

- i. Write two postulates of special theory of relativity.
- ii. What are the measurements on which two observers in relative motion will always agree upon?
- iii. Why do not we observe a "Compton Effect" with visible light?
- iv. Write postulates of Bohr's Model of the hydrogen atom.
- v. What do we mean when we say that the atom is excited?
- vi. Define the term "Isotopes" and give one example.
- vii. Differentiate between "Mass Defect" and "Binding Energy".
- viii. Why are heavy nuclei unstable?
- ix. What do we mean by the term "Critical Mass"?

(Turn Over)

(SECTION - II)

5. (a) What is a capacitor and capacitance of a capacitor? Give S.I unit of capacitance. 4+1
Derive the expression for energy stored in capacitor.
(b) How many electrons pass through an electric bulb in one minute if the 300 mA current is passing through it. 3
6. (a) What is Ampere's Law. By applying Ampere's law, find the magnetic field inside the current carrying solenoid. 5
(b) A circular coil has 15 turns of radius 2 cm each. The plane of the 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, then find the magnitude of induced emf. 3
7. (a) Describe the behaviour of A.C through R-C series circuit. 5
Calculate the impedance and phase angle of R-C series circuit.
(b) Calculate the gain of non-inverting amplifier shown in the figure: 3



8. (a) What is de-Broglie's hypothesis? How did Davisson and Germer verify it? Explain 5
(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? 3
9. (a) Explain the principle, construction and working of Geiger Muller counter. 1+4
(b) The wavelength of K x-rays from copper is 1.377×10^{-10} m. What is the energy difference between the two levels from which this transition results? 3

318-419-25000



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 questions, paper and leave others blank.

1. When some dielectric is inserted between the plates of a capacitor, then capacitance.
 - (A) decreases
 - (B) increases
 - (C) becomes zero
 - (D) becomes infinity
2. Intensity of field inside a hollow charged sphere will be
 - (A) negative
 - (B) unaffected
 - (C) zero
 - (D) maximum
3. 5A of current flows through a conductor in 2 minutes, charge in the wire is
 - (A) 500 C
 - (B) 600 C
 - (C) 400 C
 - (D) 10 C
4. The resistance of a conductor of length L , cross-sectional area ' A ' and resistivity ' ρ ' is given by
 - (A) $R = \frac{\rho}{AL}$
 - (B) $R = \rho AL$
 - (C) $R = \rho \frac{L}{A}$
 - (D) $R = \rho \frac{A}{L}$
5. Two parallel wires carrying current in the opposite directions
 - (A) may repel or attract each other
 - (B) attract each other
 - (C) have no effect on each other
 - (D) repel each other
6. The SI unit of flux density is
 - (A) $Nm^{-1}A^{-2}$
 - (B) $NA^{-1}m^{-1}$
 - (C) $NAmp^{-1}$
 - (D) $NA^{-1}m$
7. Energy stored per unit volume is called
 - (A) surface charge density
 - (B) power density
 - (C) energy density
 - (D) induction
8. If V_0 is the peak value of A.C. voltage, its rms value is
 - (A) $V_{rms} = \sqrt{2} V_0$
 - (B) $V_{rms} = \frac{V_0}{2}$
 - (C) $V_{rms} = \frac{\sqrt{2}}{V_0}$
 - (D) $V_{rms} = \frac{V_0}{\sqrt{2}}$
9. The inductive reactance X_L of coil of inductance ' L ' across an A.C. source is given by
 - (A) $X_L = \frac{1}{2\pi f L}$
 - (B) $X_L = \frac{2\pi f}{L}$
 - (C) $X_L = \frac{1}{\pi f L}$
 - (D) $X_L = 2\pi f L$
10. Conductors have conductivities of the order of
 - (A) $10^{-6}(\Omega m)^{-1}$
 - (B) $10^7(\Omega m)^{-1}$
 - (C) $10^9(\Omega m)^{-1}$
 - (D) $10^3(\Omega m)^{-1}$
11. Curie temperature for iron is
 - (A) $780^\circ C$
 - (B) $750^\circ C$
 - (C) $730^\circ C$
 - (D) $710^\circ C$
12. In n-type substance, minority charge carries are
 - (A) electrons
 - (B) holes
 - (C) protons
 - (D) neutrons
13. Conversion of only one half of A.C. into D.C. is called
 - (A) half wave amplification
 - (B) wave amplification
 - (C) half wave electrification
 - (D) half wave rectification
14. By modern system of NAVSTAR, the speed anywhere on the earth can be determined to accuracy about
 - (A) $20 ms^{-1}$
 - (B) $10 ms^{-1}$
 - (C) $2 Cms^{-1}$
 - (D) $2 ms^{-1}$
15. The value of plank's constant is
 - (A) $8.85 \times 10^{-34} JS$
 - (B) $1.6 \times 10^{-19} JS$
 - (C) $6.63 \times 10^{-34} JS$
 - (D) $6.62 \times 10^{-21} JS$
16. Paschen series lie in the
 - (A) far-ultraviolet region
 - (B) visible region
 - (C) infrared region
 - (D) ultraviolet region
17. The charge number of $^{141}_{56}Ba$ is
 - (A) 197
 - (B) 141
 - (C) 85
 - (D) 56

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

(SECTION - I)

(2 x 8 = 16)

1. Write short answers to any EIGHT questions.

- i. How can you identify that which plate of capacitor is positively charged?
- ii. Derive relation for potential gradient.
- iii. Write down any two properties of electric field lines.
- iv. Do electrons tend to go to region of high potential or of low potential? Give its reason.
- v. What is the difference between magnetic flux and magnetic flux density? Give the units of both quantities.
- vi. How the beam of electron is focused on the screen of CRO? Show it with diagram.
- 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 or non-zero.
- viii. Why the resistance of an ammeter should be very low?
- ix. What is meant by mutual inductance? Give its units.
- x. Draw and label the diagram of a D.C motor.
- 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. How would you position a flat loop of wire in a changing magnetic field, so that there is no emf induced in the loop?

(2 x 8 = 16)

3. Write short answers to any EIGHT questions.

- i. Do bends in a wire affect its electrical resistance? Explain.
- ii. Describe a circuit which will give a continuously varying potential.
- iii. Briefly describe the current through a metallic conductor and drift velocity.
- iv. An A.C. voltmeter reads 250 V. What is its peak value?
- v. A 100 μF capacitor is connected to an alternating voltage of 24 V and frequency 50 Hz. Calculate the current in the circuit.
- vi. How does doubling the frequency affect the reactance of?
a) an inductor b) a capacitor
- vii. Write a note on super conductors.
- viii. What is meant by ferromagnetic substances?
- ix. What is meant by strain energy?
- x. What is meant by forward biasing and reverse biasing of P-n junction?
- xi. Write a note on LED.
- xii. Write down the applications of photo-diode.

(2 x 6 = 12)

4. Write short answers to any SIX questions.

- i. Define Compton effect and pair production.
- ii. What advantages an electron microscope has over an optical microscope?
- iii. Which has the lower energy quanta? Radio waves or x-rays.
- iv. Define spectroscopy, holography.
- v. What are the advantages of laser over an ordinary light?
- vi. Why are heavy nuclei unstable?
- vii. A particle which produces more ionization is less penetrating. Why?
- viii. How can radioactivity help in the treatment of cancer?
- ix. Define Hadrons and Leptons.

(Turn Over)

(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 $q_1 = -1.0 \times 10^{-6} \text{ C}$ and $q_2 = 4.0 \times 10^{-6} \text{ C}$ 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 $100 \mu\text{A}$. 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?