

Note:- You have four choices for each objective type question as A, B, C and D. The choice which you think is correct; fill that circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero mark in that question. Write PAPER CODE, which is printed on this question paper, on the both sides of the Answer Sheet and fill bubbles accordingly, otherwise the student will be responsible for the situation. Use of Ink Remover or white correcting fluid is not allowed.

Q. 1

- 1) A spectrum of radiation in which the quantity being studied, such as frequency or energy takes discrete value is called \_\_\_\_\_ spectra.
  - (A) Band
  - (B) None
  - (C) Continuous
  - (D) Discrete
- 2) The particles greater in mass than protons are called
  - (A) Mesons
  - (B) Baryons
  - (C) Bosons
  - (D) Nucleons
- 3) Moderator in fission process slows down the fast neutrons and makes it easy to produce fission is
  - (A) Uranium-235
  - (B) Thorium-223
  - (C) Natural Uranium
  - (D) Uranium 239
- 4) Two opposite point charges of same magnitude separated by distance "2d", electric potential midway between them is.
  - (A) 1 V
  - (B) 2 V
  - (C) Zero
  - (D)  $\frac{1}{2}$
- 5) Electron volt (eV) is the unit of.
  - (A) Potential
  - (B) Electric field
  - (C) Energy
  - (D) Charge
- 6) The SI unit of temperature coefficient of resistivity is
  - (A)  $^{\circ}\text{C}^{-1}$
  - (B)  $^{\circ}\text{F}^{-1}$
  - (C)  $\text{K}^{-1}\text{m}$
  - (D)  $\text{K}^{-1}$
- 7) A galvanometer can be made sensitive by.
  - (A) Using a small and thick suspension
  - (B) Decreasing the area of coil
  - (C) Increasing the magnetic field
  - (D) Decreasing the turns of coil
- 8) \_\_\_\_\_
  - (A) Circular
  - (B) Spiral
  - (C) Helix
  - (D) Ellipse
- 9) The principle of an electric generator is based on.
  - (A) Coulomb's Law
  - (B) Faraday's Law of Electro magnetic Induction
  - (C) Ampere's Law
  - (D) Lenz's Law
- 10) The SI unit of mutual induction is
  - (A)  $\text{Vs}^{-1}\text{A}^{-1}$
  - (B)  $\text{VsA}^{-1}$
  - (C) Henry
  - (D) Both (B) & (C)
- 11) An expression for capacitive reactance is given by.
  - (A)  $X_c = \frac{1}{2\pi fC}$
  - (B)  $X_c = \frac{1}{2\pi f}$
  - (C)  $X_c = 2\pi fC$
  - (D)  $X_c = 2\pi fL$
- 12) At what frequency will an inductor of 1.0 H have a reactance of  $500\ \Omega$ ?
  - (A) 90 Hz
  - (B) 100 Hz
  - (C) 80 Hz
  - (D) 110 Hz
- 13) The electrical resistance of mercury disappears suddenly as the temperature is reduced
  - (A) Above 4.2 K
  - (B) Below 4.2 K
  - (C) To 4.2 K
  - (D) 7.1 K
- 14) In P-type material, the majority charge carriers are
  - (A) Electrons
  - (B) Protons
  - (C) No charge
  - (D) Holes
- 15) The output of two input OR Gate is "0" only when its.
  - (A) Both inputs are "0"
  - (B) Either input is "1"
  - (C) Both inputs are "1"
  - (D) Either input is "0"
- 16) The mass "m" of a moving object with speed  $0.8c$  is.
  - (A)  $0.66 m_0$
  - (B)  $0.97 m_0$
  - (C)  $1.67 m_0$
  - (D)  $1.08 m_0$
- 17) In Compton effect the wavelength of scattered X-rays is \_\_\_\_\_ than the wavelength of incident X-rays.
  - (A) Smaller
  - (B) Larger
  - (C) Same order
  - (D) All of these

SGD-12-1-23

1223 Warning:- Please, do not write anything on this question paper except your Roll No.  
Physics (Subjective) (Group I) (Session 2019-21 to 2021-23) (Inter Part - II) Paper (II)

Time Allowed: 2.40 hours

Section ----- I

Maximum Marks: 68

$8 \times 2 = 16$

2. Answer briefly any Eight parts from the followings:-

- (i) How can you identify that which plate of a capacitor is positively charged.
- (ii) Electric lines of force never cross. Why? (iii) Write down the properties of electric field lines.
- (iv) How can we find the dielectric constant of a material using a capacitor.
- (v) If a charged particle moves in a straight line through some region of space, can we say that the magnetic in the region is zero. (vi) Why does the picture on a TV screen becomes distorted when a magnet is brought near the screen.
- (vii) What is meant by Lorentz force. Give its equation.
- (viii)  $\vec{B} = 40\hat{i} - 18\hat{k}$ . How much flux passes through  $5 \text{ cm}^2$  area of loop in xy-plane.
- (ix) What are isotopes? What do they have common and what are their differences.
- (x) How radioactivity can help in treatment of cancer? (xi) What does a mass-spectrograph do.
- (xii) Explain the process of  $\alpha$ -decay with an example

$8 \times 2 = 16$

3. Answer briefly any Eight parts from the followings:-

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

4. Answer briefly any Six parts from the followings:-

$6 \times 2 = 12$

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

Note: Attempt any three questions.

Section ----- II

$(8 \times 3 = 24)$

5. (a) Define conventional current. How current passes through a metallic conductor. Also explain drift velocity of electrons in a metal.  
(b) Determine the electric field at the position  $\vec{r} = (4\hat{i} + 3\hat{j})\text{m}$  caused by a point charge  $q = 5.0 \times 10^{-6} \text{ C}$  placed at origin.
6. (a) Define and explain mutual induction. Also derive relation for mutual induction.  
(b) How fast must a proton move in a magnetic field of  $2.50 \times 10^{-3} \text{ T}$  such that the magnetic force is equal to its weight?
7. (a) What is operational amplifier? How operational amplifier as a comparator, act as a "Night Switch".  
(b) A circuit has an inductance of  $\frac{1}{\pi} \text{ H}$  and resistance of  $2000 \Omega$ . A  $50 \text{ Hz}$  A.C is supplied to it. Calculate the reactance and impedance offered by the circuit.
8. (a) What is energy band theory? How does this theory explain diverse electric behaviour of solids?  
(b) X-rays of wavelength  $22 \text{ pm}$  are scattered from a carbon target. The scattered radiations being viewed at  $85^\circ$  to the incident beam. What is Compton shift?
9. (a) What is mass spectrograph? Describe an experimental arrangement of a spectrograph and derive the relation showing mass and  $B^2$  as in linear relation.  
(b) Calculate the longest wavelength of radiation for the Paschen series.

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( Inter Part – II)

(Session 2019-21 to 2021-23)

Sig. of Student -----

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

Paper (II)

Time Allowed:- 20 minutes

PAPER CODE 4476

Maximum Marks:- 17

Note:- You have four choices for each objective type question as A, B, C and D. The choice which you think is correct; fill that circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero mark in that question. Write PAPER CODE, which is printed on this question paper, on the both sides of the Answer Sheet and fill bubbles accordingly, otherwise the student will be responsible for the situation. Use of Ink Remover or white correcting fluid is not allowed.

Q. 1

- 1) Isotopes of Xenon are  
(A) 12 (B) 24 (C) 36 (D) 37
- 2) Binding energy per nucleon is maximum for  
(A) Uranium (B) Gold (C) Silver (D) Iron
- 3) The value of relative permittivity of air is close to  
(A) Vacuum (B) Paraffined paper (C) Teflon (D) Transformer oil
- 4) The electric flux through any close surface is depending on  
(A) Shape of close surface (B) Medium (C) Size of close surface (D) Location of charge
- 5) Thermo-couples convert heat energy into  
(A) Wind energy (B) Potential energy (C) Nuclear energy (D) Electrical energy
- 6) The value of permittivity of free space is  
(A)  $4\pi \times 10^{-7} \text{WbA}^{-1}\text{m}^{-1}$  (B)  $\pi \times 10^{-7} \text{WbA}^{-1}\text{m}^{-1}$  (C)  $2\pi \times 10^{-7} \text{WbA}^{-1}\text{m}^{-1}$  (D)  $2\pi r \times 10^{-7} \text{WbA}^{-1}\text{m}^{-1}$
- 7) The magnetic field inside the current carrying long solenoid is  
(A) Strong (B) Weak (C) Zero (D) Uniform
- 8) The magnetic field inside the current carrying long solenoid is  
(A) Maximum (B) Zero (C) Minimum (D) 3V
- 9) Lenz's law is called as the law of conservation of  
(A) Charge (B) Parity (C) Momentum (D) Energy
- 10) Direct current cannot pass through  
(A) Inductor (B) Resistor (C) Chock (D) Capacitor
- 11) The expression for inductive reactance is  
(A)  $\omega L$  (B)  $\frac{2\pi L}{f}$  (C)  $\frac{1}{\omega L}$  (D) TL
- 12) The critical temperature of mercury is .  
(A) 1.18 K (B) 4.2 K (C) 3.72 K (D) 7.2 K
- 13) Actual movement across the diode Junction is due to  
(A) Holes (B) Ions (C) Protons (D) Electrons
- 14) At the junction of diode, where no charge carrier is present is called  
(A) Active region (B) Depletion region (C) Saturated region (D) Forbidden region
- 15) Which one explain particle nature of light  
(A) Interference (B) Diffraction (C) Polarization (D) Photoelectric effect
- 16) Who gave the idea of matter waves  
(A) Einslein (B) Huygen (C) De-Broglie (D) Newton
- 17) Electron cannot be resided in the nucleus, it can be proved by  
(A) Photoelectric effect (B) Pair production (C) Uncertainty principle (D) De-Broglie Hypothesis

1223- 1223 -- 12000 (3)

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

2. Answer briefly any Eight parts from the followings:- *SAD-12-2-238*  $\times 2 = 16$
- Write similarity and differences between electrostatic and gravitational forces?
  - Verify that an ohm times farad is equivalent to second? (iii) Electric lines of forces never cross. Why?
  - Is 'E' necessarily zero inside a charged rubber balloon, if balloon is spherical? Assume that charge is distributed uniformly over the surface?
  - Why the resistance of an ammeter should be very low?
  - Why does the picture on a TV screen become distorted when a magnet is brought near the screen?
  - Draw saw tooth voltage wave form and describe it? (viii) Write uses of CRO?
  - Write the names of hydrogen isotopes with their symbols?
  - Why moderators are used in the core of nuclear reactor?
  - Why are heavy nuclei unstable? (xii) A particle which produces more ionization is less penetrating?

3. Answer briefly any Eight parts from the followings:-

$8 \times 2 = 16$

- Do bends in a wire affects its electrical resistance? Explain.
- On what factors chemical effect of current depends?
- Describe a circuit which will give continuously varying potential.
- How many times per second will an incandescent lamp reach a maximum brilliance when connected to a 50 Hz source?
- What is Amplitude Modulation and Frequency Modulation?
- How the reception of a particular radio station is selected on your radio set?
- What is meant by hysteresis loss? How it is used in the construction of a transformer?
- Distinguish between Elasticity and plasticity of a body.
- Discuss the mechanism of electrical conduction by "Holes" and "Electrons" in a pure semiconductor elements.
- Why is the base current in a transistor is very small?
- Draw the circuit diagram for "Half wave" and "Full wave" rectification.
- Why ordinary silicon diodes donot emit light?

4. Answer briefly any Six parts from the followings:-

$6 \times 2 = 12$

- What is back emf effect in motors? (ii) What are advantages of lasers over ordinary light.
- Can a DC motor be turned in a DC generator? What changes are required?
- Does induced emf in a circuit depend on the resistance of the circuit? Explain.
- Which has the lower energy quanta? Radiowaves or X-rays. (vi) Can pair production take place in vacuum? Explain.
- Draw block diagram of electron microscope. Write any one of its advantage.
- What is planck's assumption to explain black body radiations?
- What is a spectral series? Name any one spectral series of hydrogen with its relation.

Note: Attempt any three questions.

Section ----- II

$(8 \times 3 = 24)$

- Derive the equation of a balanced wheatstone Bridge with diagram.
  - A particle having a charge of 20 electrons on it falls through a potential difference of 100 volts. Calculate the energy acquired by it in electron-volts (eV).
- Find the relation of force on a moving charge in a constant magnetic field. Also find its direction.
  - A coil of 10 turns and  $35 \text{ cm}^2$  area is in a perpendicular magnetic field of 0.5T. The coil is pulled out of the field in 1.0 S. Find the induced emf in the coil as it is pulled out of the field.
- Explain the RLC series resonance circuit. Derive the relation for resonance frequency. Also discuss the properties of series resonance circuit?
  - In a certain circuit the transistor has collector current of 10 mA and base current is  $40 \mu \text{ A}$ . What is the current gain of transistor?
- Define and explain uncertainty principle.
  - A wire 2.5m long and cross-sectional area  $10^{-5} \text{ m}^2$  is stretched 1.5 mm by a force of 100N in the elastic region. Calculate. (i) the strain. (ii) Young's modulus. (iii) The energy stored in the wire.
- What is solid state detector? Explain its principle, construction and working.
  - An electron jumps from a level  $E_i = -3.5 \times 10^{-19} \text{ J}$  to  $E_f = -1.20 \times 10^{-19} \text{ J}$   
What is the wavelength of the emitted light.

1224-- 1223 -- 12000

1222 Warning:- Please write your Roll No. in the space provided and sign. Roll No-----  
( Inter Part – II) (Session 2018-20 to 2020-22) Sig. of Student -----

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

Time Allowed:- 20 minutes

**PAPER CODE 4478**

Maximum Marks:- 17

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**Q. 1**

- 1) Production of X-rays is the reverse process of  
(A) Photoelectric effect (B) Compton effect (C) Inhalation (D) Pair Production
- 2) The Binding energy for Helium is given by  
(A) 30.2 MeV (B) 2.25 MeV (C) 2.28 MeV (D) 28.2 MeV
- 3) After two half-lives the number of decayed nuclei of an element are  
(A)  $N/4$  (B)  $N/2$  (C)  $3N/4$  (D)  $N$
- 4) Photo copier and injek printer are the application of :  
(A) Magnetism (B) Electricity (C) Electro magnetism (D) Electro static
- 5) SI unit of electric flux is:  
(A)  $Nm^2 c^{-1}$  (B)  $Nmc^{-1}$  (C)  $Nm^{-1} c^{-1}$  (D)  $Nm^3 c^{-2}$
- 6) When the internal resistance of source is equal to the load maximum power dissipated is  
(A)  $E/4r$  (B)  $E/4r^2$  (C)  $E^2/4r$  (D)  $E^2/4r^2$
- 7) Unit of magnetic flux density is  
(A)  $wb m^{-2}$  (B)  $NA^{-1} m^{-1}$  (C) Tesla (D) All of above
- 8) When a charge is projected perpendicular to uniform magnetic field its path is:  
(A) Spiral (B) Circular (C) Helix (D) Ellipse
- 9) If the angular frequency of A.C Generator increased to double, the time period would become  
(A) Half (B) Double (C) 4 Times (D)  $\frac{1}{4}$  Times
- 10) "Eddy current" are set up in a direction:  
(A) parallel to flux (B) anti parallel to flux (C) at  $45^\circ$  to flux (D) perpendicular to the flux
- 11) When effective value of current is 10. What is its peak value?  
(A) 10 (B) 14.2 (C) 12 (D) 13
- 12) Which are the Substance called \_\_\_\_\_ which undergo plastic deformation until they break.  
(A) Brittle (B) Ductile (C) Amorphous (D) Polymeric
- 13) Choke consumes extremely small.  
(A) Current (B) Charge (C) Power (D) Potential
- 14) The size of base in a transistor is  
(A)  $10^{-6} m$  (B)  $10^{-8} m$  (C)  $10^{-7} m$  (D) 10 m
- 15) \_\_\_\_\_ is the building block of every complex electronic circuit.  
(A) Resistor (B) Capacitor (C) Amplifier (D) Diode
- 16) The unit of work function is  
(A) volt (B) joule (C) watt (D) Farad
- 17) Compton's Shift will be maximum at the angle of  
(A)  $90^\circ$  (B)  $360^\circ$  (C)  $180^\circ$  (D)  $60^\circ$

*Q. 1* **1217- 1222 -- 19000 (4)**

1222

Warning:- Please, do not write anything on this question paper except your Roll No.

Physics (Subjective)

Group (II)

(Session 2018-20 to 2020-22)

Paper (II)

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

2. Answer briefly any Eight parts from the followings:-  $540-42-228 \times 2 = 16$ 

- (i) How the capacitance is increased by placing a dielectric b/w the plates of a capacitor?
- (ii) Prove that time constant is equal to  $R \times C$ , where R is resistance and 'C' is capacitance.
- (iii) Calculate the force b/w two similar charges of unit magnitude placed 1 meter apart in air.
- (iv) The potential is constant throughout a given region of space. Is the electric field zero or non-zero in this region? Explain.
- (v) Can an electron at rest be set in motion by bringing a magnet close to that electron? Explain.
- (vi) A current in a conductor produces a magnetic field, which can be calculated using Ampere's Law. Since current is defined as the rate of flow of charge, what can you conclude about the magnetic field due to stationary charges? What about moving charges.
- (vii) How can a current loop be used to determine the presence of a magnetic field in a given region of space.
- (viii) Why the resistance of an ammeter should be very low?
- (ix) Mass defect for helium is 0.03034u. Calculate its binding energy in (eV).
- (x) What fraction of a radioactive sample decays after two half lives have elapsed?
- (xi) Describe the interaction of beta radiations with matter.
- (xii) A particle which produces more ionization is less penetrating. why?

3. Answer briefly any Eight parts from the followings:-

 $8 \times 2 = 16$ 

- (i) Define thermistors. Write its one application.
- (ii) Starting from left a carbon resistance has colour bands in the order Red, violet, orange and silver. Calculate the value of resistance with tolerance.
- (iii) Do bends in a wire affect its electrical resistance? (iv) Define Choke.
- (v) How many times per second will an incandescent lamp reach maximum brilliance when connected to a 50 Hz source?
- (vi) How does doubling the frequency affect the reactance of (a) an inductor (b) a capacitor
- (vii) What is meant by paramagnetic and diamagnetic substances. Give examples for each.
- (viii) On the basis of energy band theory distinguish between insulators and conductors.
- (ix) Define retativity and Coercivity. (x) What is Photodiode? Write down its two applications.
- (xi) Write down the Truth table and symbol of NAND gate.
- (xii) Why Photo diode is operated in reverse biased state?

4. Answer briefly any Six parts from the followings:-

 $6 \times 2 = 12$ 

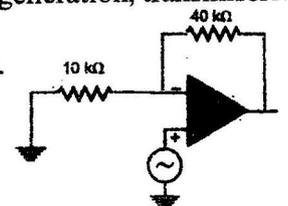
- (i) Show that  $\epsilon$  and  $\frac{\Delta\phi}{\Delta t}$  have the same units.
- (ii) How would you position a Flat loop of wire in a changing magnetic Field so that there is no emf induced in the loop?
- (iii) What are the dimensions of mutual Inductance? (iv) State Faraday's Law. Write its Mathematical expression
- (v) Which Photon, red, green or blue carries the most: (a) energy (b) momentum
- (vi) Why can red light be used in a photographic dark room when developing Films, but not blue or white light?
- (vii) Define Photoelectric effect and Pair Production. (viii) What are the advantages of lasers over ordinary light?
- (ix) What is biological effects of X-rays?

Note: Attempt any three questions.

Section ----- II

 $(8 \times 3 = 24)$ 

5. (a) What is potentiometer? How it can be used as, (i) Potential divider (ii) Measuring of emf of a cell.  
(b) Two point charges  $q_1 = -1.0 \times 10^{-6} C$  and  $q_2 = 4.0 \times 10^{-6} C$ , are separated by a distance of 3.0 m. Find and justify the zero-field location?
6. (a) Describe the method to determine the e/m of an electron.  
(b) A circular coil has 15 turns of radius 2cm each. The plane of the coil lies at  $40^\circ$  to a uniform magnetic field of 0.2 T. If the field is increase by 0.5 T in 0.2 s. Find Magnitude of the Induce emf.
7. (a) What is the band theory of solids. Differentiate between insulator, conductor and semiconductor on the basis of this theory.  
(b) A 50 keV photon is Compton scattered by a quasi-free electron. If the scattering angle of photon is  $45^\circ$ , what is its wavelength of the scattering.
8. (a) Describe the production of X-rays. Write down the use of X-rays to visualize the fractured bones and defects in structural steel.  
(b) The half life of  $^{91}_{33}Sr$  is 9.70 hours. Find the decay constant.
9. (a) What are electromagnetic waves. How can you explain principle of generation, transmission and reception of electromagnetic waves.  
(b) Calculate the gain of non-Inverting amplifier shown in figure below.



1218-- 1222 -- 19000

1222 Warning:- Please write your Roll No. in the space provided and sign. Roll No-----  
( Inter Part – II) (Session 2018-20 to 2020-22) Sig. of Student -----

Physics (Objective) (Group I)

*S.D.G. 22*  
**PAPER CODE 4471**

Paper (II)

Maximum Marks:- 17

Time Allowed:- 20 minutes

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Q. 1

- 1) A rubber ball of radius 2 cm has a charge of  $5 \mu\text{C}$  on its surface, which is uniformly distributed. The value of E at its Centre is  
(A)  $10 \text{ NC}^{-1}$  (B) Zero (C)  $2.5 \text{ NC}^{-1}$  (D)  $5 \times 10^{-6} \text{ NC}^{-1}$
- 2) The minimum value of charge on free particle is  
(A)  $\frac{2}{3} e$  (B)  $\frac{1}{3} e$  (C)  $\frac{-2}{3} e$  (D)  $e$
- 3) During danger the 'eel' turn itself into a living battery. Then the potential difference between its head and tail can be upto  
(A) 600 V (B) 440 V (C) 220 V (D) 160 V
- 4) The sum of electric and magnetic force is called  
(A) Maxwell force (B) Newton's force (C) Lorentz force (D) Centripetal force
- 5) Output waveform of sweep or time base generator is  
(A) Saw tooth wave (B) Digital wave (C) Sinusoidal wave (D) Square wave
- 6) Emf is induced due to change in  
(A) Electric flux (B) Magnetic flux (C) Electric potential (D) Electric current
- 7) When the motor is just started, its back emf is  
(A) Maximum (B) Minimum (C) Almost zero (D) Equal to current
- 8) An A.C Voltmeter reads 220V, its peak value will be  
(A) 255 V (B) 311.12 V (C) 300 V (D) 200 V
- 9) When we accelerate the charge, which type of waves are produced?  
(A) Mechanical waves (B) Travelling waves (C) Stationary waves (D) Electromagnetic waves
- 10) A device used to detect very weak magnetic fields produced by brain is named as  
(A) MRI (B) CAT Scans (C) SQUIDS (D) C.R.O
- 11) The magnitude of voltage gain of an amplifier having  $r_{ie}=1 \text{ ohm}$ ,  $\beta = 100$  and  $R_c=200 \text{ ohm}$  is  
(A) 2000 (B) 1000 (C) 500 (D) 5
- 12) Which one is used as temperature sensor in electrical circuit?  
(A) Capacitor (B) diode (C) LDR (D) Thermistor
- 13) The rest mass of photon is  
(A) infinite (B) zero (C)  $1.6 \times 10^{-27} \text{ kg}$  (D)  $3 \times 10^8 \text{ kg}$
- 14) The materialization of energy takes place in the process of  
(A) photoelectric effect (B) Compton effect (C) Pair Production (D) Annihilation of matter
- 15) The unit of Rydberg's constant  $R_H$  is  
(A)  $\text{ms}^{-1}$  (B) m (C)  $\text{m}^2$  (D)  $\text{m}^{-1}$
- 16) The unit of decay constant is  
(A) Second (B)  $(\text{Second})^{-1}$  (C)  $\text{m}^{-1}$  (D) m.K
- 17) Half life of radioactive isotope of Iodine-131 is  
(A) 6 days (B) 8 days (C) 10 days (D) 12 days

*S.D.G.* 1215 - 1222-- 23000 (1)

1222 Warning:- Please, do not write anything on this question paper except your Roll No.

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

Time Allowed: 2.40 hours

Section ----- I

Maximum Marks: 68

2. Answer briefly any Eight parts from the followings:- *SD-41-228*  $\times 2 = 16$

- (i) How can you identify that which plate of a capacitor is positively charged?
- (ii) Suppose that you follow an electric field line due to positive point charge. Do electric field and the potential increase or decrease?
- (iii) What is meant by EEG and ECG? (iv) Show that  $1 \text{ eV} = 1.6 \times 10^{-19} \text{ J}$
- (v) Why the voltmeter should have a very high resistance?
- (vi) Is it possible to orient a current loop in a uniform magnetic field such that the loop will not tend to rotate? Explain.
- (vii) Write any two uses of CRO. (viii) What is dead beat galvanometer?
- (ix) What factors make a fusion reaction difficult to achieve?
- (x) What do you understand by "background" radiations? State two sources of this radiation.
- (xi) Define mass defect and binding energy. (xii) What are basic forces of nature?

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

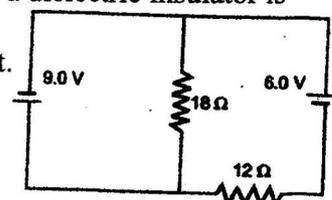
- (i) A charge of 90 C passes through a wire in 1 hour and 15 minute. What is the current in the wire.
- (ii) Why does the resistance of a conductor rise with temperature?
- (iii) Differentiate between electro motive force (EMF) and potential difference?
- (iv) What do you mean by phase lag and phase lead?
- (v) How does doubling the frequency affect the reactance of (a) an inductor (b) a capacitor
- (vi) Explain the conditions under which electromagnetic waves are produced from a source?
- (vii) Differentiate between ductile and brittle substances; Give Examples?
- (viii) Define retentivity and coercive current?
- (ix) What is meant by para, dia and ferromagnetic substances? Give examples for each.
- (x) The anode of diode is 0.2 V positive with respect to its cathode. Is it forward biased?
- (xi) Why a photodiode is operated in reverse biased state?
- (xii) Define rectification. Draw a circuit diagram of half wave rectification.

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

- (i) Write any two methods in which current induce in a coil.
- (ii) Show that  $\epsilon$  and  $\frac{\Delta\phi}{\Delta t}$  have same units. (iii) Why the motor is overloaded? Give its Reason.
- (iv) Does the induce emf always act to decrease the Magnetic flux through the circuit?
- (v) What are the measurement on which two observers in relative motion will always agree upon?
- (vi) As a solid is heated and begin to glow, why does it first appear red?
- (vii) Write two postulates of special theory of relativity.
- (viii) Can X-rays be reflected, refracted Diffracted and Polarized just like any other waves? Explain.
- (ix) Is energy conserved when an atom emit a photon of light.

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

5. (a) What is motional emf. Derive an expression for it.  
(b) How fast must a proton move in a magnetic field of  $2.50 \times 10^{-3} \text{ T}$  such that magnetic force is equal to its weight.
6. (a) What is the behaviour of A.C. current and voltage in an inductor? Discuss power loss through an inductor over a period.  
(b) The current flowing into the base of a transistor is  $100 \mu\text{A}$ . Find its collector current and its emitter current, if the value of current gain is 100.
7. (a) Explain Photo electric effect. Write its experimental results, also the failure of classical theory.  
(b) What stress would cause a wire to increase in length by 0.01%, if the Young's modulus of wire is  $12 \times 10^{10} \text{ Pa}$ . What force would produce this stress, if the diameter of wire is 0.56 mm.
8. (a) What is meant by half life of radioactive element? How it can be determined by the decay of radioactive element.  
(b) An Electron jumps a level  $E_i = -3.5 \times 10^{-19} \text{ J}$  to  $E_f = -120 \times 10^{-18} \text{ J}$  What is the wavelength of emitted light?
9. (a) Explain capacitance of parallel plate capacitor. What happens when a dielectric insulator is placed between the plates?  
(b) Find the current which flows in all the resistance of the given circuit.



*1216* 1216 -- 1222-- 23000

Note:- You have four choices for each objective type question as A, B, C and D. The choice which you think is correct; fill that circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero mark in that question. Write **PAPER CODE**, which is printed on this question paper, on the both sides of the Answer Sheet and fill bubbles accordingly. Otherwise the student will be responsible for the situation. Use of Ink Remover or white correcting fluid is not allowed.

Q. 1

- 1) A parallel plate capacitor with oil between the plate ( $\epsilon_r = 2$ ) has a capacitance  $C$ . If the oil is removed then capacitance of capacitor becomes.
- (A)  $C$  (B)  $\frac{C}{2}$  (C)  $\frac{C}{\sqrt{2}}$  (D)  $\sqrt{2}C$
- 2) An ECG records the \_\_\_\_\_ between points on human skin generated by electrical process in the heart.
- (A) Heart beat (B) Pulse rate (C) Voltage (D) Pressure
- 3) If the length of the conductor is doubled and its cross sectional area is halved, its conductance will
- (A) Increases four times (B) Becomes one-fourth (C) Becomes one-half (D) Remains unchanged
- 4) For a current carrying solenoid the term 'n' has unit as
- (A) No unit (B) m (C)  $m^{-1}$  (D)  $m^{-2}$
- 5) Two long parallel wires carrying current in the same direction.
- (A) Attract (B) Repel (C) Turn (D) No effect
- 6) The current in a coil changes from 0 to 2 A in 0.05 s. If the induced emf is 80 V, the self inductance of the coil is
- (A) 1 H (B) 0.5 H (C) 1.5 H (D) 2 H
- 7) Maximum motional emf in a conductor is given by  $VBL$ . At which angle the conductor moves in magnetic field such that emf in it becomes half then its maximum value is
- (A)  $0^\circ$  (B)  $30^\circ$  (C)  $45^\circ$  (D)  $60^\circ$
- 8) At high frequency the current through a capacitor of A.C. Circuit will be
- (A) Large (B) Small (C) Infinite (D) Zero
- 9) With increase in frequency of an A.C. supply, the impedance of RLC series circuit.
- (A) Decreases (B) Increases (C) Remains constant (D) 1st decrease, become minimum and then increase
- 10) Curie temperature for iron is about
- (A) 750 K (B) 570 K (C) 1023 K (D) 670 K
- 11) If  $R_1 = \infty$  and  $R_2 = 0$ , then gain of non-inverting amplifier is
- (A) 0 (B) 1 (C) 2 (D) Infinity
- 12) The term transistor Stands for
- (A) Transfer of resistance (B) Transfer of voltage (C) Transfer of current (D) All of these
- 13) In the equation  $\Delta\lambda = \frac{h}{m_0c} (1 - \cos\theta)$  which factor is called Compton wavelength
- (A)  $\frac{h}{m_0c}$  (B)  $\frac{1}{m_0c}$  (C)  $(1 - \cos\theta)$  (D)  $\frac{h}{m_0c} (1 - \cos\theta)$
- 14) In photoelectric effect if the intensity of light is made twice than initial value. The maximum K.E of photoelectron becomes
- (A) Same (B) Double (C) Half (D) Four times
- 15) The energy of the 4<sup>th</sup> orbit in hydrogen atom is
- (A) -13.6 eV (B) - 0.85 eV (C) -3.40 eV (D) -1.51 eV
- 16) In which nuclear detector, visible path of ionizing particle is shown
- (A) Wilson cloud chamber (B) GM Counter (C) Solid State detector (D) All of these
- 17) The binding energy per nucleon is
- (A) Greatest for heavy nuclei (B) Least for heavy nuclei (C) Greatest for light nuclei (D) Greatest for medium weight nuclei

1221 Warning:- Please, do not write anything on this question paper except your Roll No.

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

Time Allowed: 2.40 hours

Section ----- I

Maximum Marks: 68

Answer briefly any Eight parts from the followings:- **S4D-I-2) 8 × 2 = 16**

- (i) Is E necessarily zero inside a charged rubber balloon if balloon is spherical? Assume that charge is distributed uniformly over the surface?
- (ii) How can you identify that which plate of a capacitor is positively charged?
- (iii) State Gauss's law and write mathematical expression. (iv) Write four properties of electric field lines.
- (v) How can a current loop be used to determine the presence of a magnetic field in a given region of space?
- (vi) Why does the picture on a TV screen become distorted when a magnet is brought near the screen?
- (vii) State Ampere's circuital law and write its mathematical expression.
- (viii) What is CRO? Write only its main parts. (ix) Show that  $\epsilon$  and  $\frac{\Delta\Phi}{\Delta t}$  have the same unit.

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

(xi) Define mutual inductance and write its unit.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

(viii) If someone accidentally swallows an  $\alpha$  -source and a  $\beta$  -source. Which would be the more

dangerous to him? Explain why? (ix) Define the terms mass defect and binding energy.

Note: Attempt any three questions.

Section ----- II

(8 × 3 = 24)

5. (a) Explain in detail, electrical power and power dissipation in resistor.

(b) The time constant of a series RC circuit is  $t = RC$ . Verify that an ohm times farad is equivalent to second.

6. (a) Derive an expression for torque on current carrying coil in uniform magnetic field.

(b) A coil of 10 turns and  $35 \text{ cm}^2$  area is in a perpendicular magnetic field of 0.5 T. The coil is pulled out of the field in 1.0 s. Find the induced emf in the coil as it is pulled out of the field.

7. (a) What is operational amplifier? How op. Amplifier is used as Non Inverting Amplifier?

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

8. (a) What are intrinsic and extrinsic semi conductors? Describe the formation of N-type and P-type semi conductors.

(b) If  ${}_{92}^{233}\text{U}$  decays twice by  $\alpha$  - emission, what is the resulting isotope?

9. (a) State Postulates of Bohr's model of Hydrogen atom and show that hydrogen atom has quantized radii.

(b) An electron is accelerated through a potential difference of 50 V calculate its de-Broglie wave length.

Physics (Objective)

(Group II)

PAPER CODE 4478

S40-II-21

Paper (II)

Maximum Marks:- 17

Time Allowed:- 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 or more circles will result in zero mark in that question. Write PAPER CODE, which is printed on this question paper, on the both sides of the Answer Sheet and fill bubbles accordingly, otherwise the student will be responsible for the situation. Use of Ink Remover or white correcting fluid is not allowed.

Q. 1

- 1) In the Bohr's model of hydrogen atom, the lowest orbit corresponds to  
(A) Infinite energy (B) Zero energy (C) Minimum energy (D) Maximum energy
- 2) Which of the following conservation law hold in nuclear transmutation.  
(A) Mass (B) Energy (C) Momentum (D) All of these
- 3) The building blocks of protons and neutrons are  
(A) Ions (B) Electrons (C) Positrons (D) Quarks
- 4) The energy density in a capacitor is directly proportional to  
(A)  $\epsilon_0 \epsilon_r$  (B)  $E^2$  (C)  $C^2$  (D)  $V^2$
- 5) The negative sign in the expression of potential gradient  $\vec{E} = -\frac{\Delta \vec{V}}{\Delta r}$  shows that, direction of  $\vec{E}$  is along.  
(A) Increasing potential (B) Decreasing potential (C) Increasing strength (D) Negative potential
- 6) Colour code of 10  $\Omega$  resistance with 5% tolerance is  
(A) Black, black, Brown, Silver (B) Brown, black, black, Gold (C) Black, brown, black, Gold (D) Brown, brown, black, Gold
- 7) The brightness of spot on C.R.O screen is controlled by  
(A) Anodes (B) Cathodes (C) Grid (D) Plates
- 8) Magnetic flux density at a point due to current carrying coil is determined by  
(A) Ampere's Law (B) Gauss's Law (C) Faraday's Law (D) Lenz's Law
- 9) The direction of induced current is always so as to oppose the change which causes the current is  
(A) Faraday's Law (B) Lenz's Law (C) Ohm's Law (D) Kirchoff's 1st rule
- 10) When current flowing through an inductor is doubled, then energy stored in it becomes.  
(A) Half (B) Four times (C) One fourth (D) Double
- 11) In RLC series circuit, the current at resonance frequency is  
(A) Minimum (B) Maximum (C) Zero (D) Infinite
- 12) When 10 V are applied to an A.C circuit, the current flowing in it is 100 mA, its impedance is  
(A) 50  $\Omega$  (B) 75  $\Omega$  (C) 100  $\Omega$  (D) 90  $\Omega$
- 13) If stress is increased beyond the elastic limit of a material, it becomes permanently changed, this behaviour of material is called.  
(A) Elasticity (B) Plasticity (C) Yield strength (D) Ultimate tensile strength
- 14) The potential barrier of silicon at room temperature is  
(A) 0.3 V (B) 0.7 V (C) 3.0 V (D) 7.0 V
- 15) The voltage gain of an amplifier having  $r_{ie} = 1\Omega$ ,  $\beta = 100$ ,  $R_c = 20\Omega$  is  
(A) 2000 (B) 1000 (C) 500 (D) 5
- 16) When a photon collide with an electron, which of following of photon increases.  
(A) Frequency (B) Energy (C) Wave Length (D) Mass
- 17) Which of the following explain particle nature of light?  
(A) Interference (B) Diffraction (C) Photoelectric effect (D) Polarization

1277 - 1221 ALP -- 15000 (4)

Allowed: 2.40 hours

Section ----- I

Maximum Marks: 68

Answer briefly any Eight parts from the followings:- **S40-I-2**  $8 \times 2 = 16$

- How can you identify that which plate of a capacitor is positively charged?
- (i) Do electrons tend to go to region of High potential or of low potential?
  - (iii) How much energy will store in a capacitor of capacitance  $1.0 \mu F$  having electrical potential of 10.0 V between the parallel plates capacitor. (iv) Define electron volt. Is it a unit of electrical potential or energy.
  - (v) Is it possible to orient a current loop in a uniform magnetic field such that the loop will not tend to rotate? Explain.
  - (vi) How can you use a magnetic field to separate isotopes of chemical element?
  - (vii) A current carrying rectangular coil is rotating in a magnetic field. What factors does the torque of coil depend?
  - (viii) How can phase difference between two voltages be obtained by Cathode Ray Oscilloscope?
  - (ix) Does the induced emf in a circuit depend on the resistance of the circuit? Does the induced current depend on the resistance of the circuit? (x) Show that  $\varepsilon$  (emf) and  $\frac{\Delta\phi}{\Delta t}$  have the same units.
  - (xi) What will be the energy density of current carrying solenoid if magnetic field is doubled?
  - (xii) Does the self inductance depend on the rate of change of current?

3. Answer briefly any Eight parts from the followings:-

$8 \times 2 = 16$

- (i) State Kirchoff's Rules. (ii) A sinusoidal current has rms value of 10 A. What is the maximum or peak value?
  - (iii) A potential difference is applied across the ends of a copper wire. What is the effect on the drift velocity of free electrons by decreasing the length and the temperature of the wire?
  - (iv) What is Wheatstone bridge? How can it be used to determine an unknown resistance?
  - (v) A circuit contains an iron-cored inductor, a switch and a D.C. source arranged in series. The switch is closed and after an interval reopened. Explain why a spark jumps across the switch contacts?
  - (vi) Why the choke is used in A.C. circuits? (vii) Define Retativity and coercive current.
  - (viii) Write the name of four applications of superconductors.
  - (ix) Explain briefly the semiconductors in terms of energy band theory. (x) Write name of applications of photodiode.
  - (xi) What is the biasing requirement of the junctions of a transistor for its normal operation? Explain how these requirements are met in a common emitter amplifier.
  - (xii) How does the motion of an electron in a n-type substance differ from the motion of holes in a p-type substance?
4. Answer briefly any Six parts from the followings:-
- (i) Can pair production takes place in vacuum? Explain. (ii) Is it possible to create a single electron from energy? Explain.
  - (iii) We do not notice the de Broglie wavelength for a pitched cricket ball. Explain why?
  - (iv) What do we mean when we say that the atom is excited? (v) Write down any four uses of Laser.
  - (vi) What do you understand by "background radiation"? State two sources of this radiation.
  - (vii) What information is revealed by the length and shape of the tracks of an incident particle in Wilson cloud chamber?
  - (viii) Describe the principle of operation of a solid state detector of ionizing radiation in terms of generation and detection of charge carriers.
  - (ix) Discuss the advantages and disadvantages of nuclear power compared to the use of fossil fuel generated power.

Note: Attempt any three questions.

Section ----- II

$(8 \times 3 = 24)$

- 5. (a) What is Wheatstone bridge? Derive a relation for its balancing condition.  
(b) Two opposite point charges each of magnitude  $q$  are separated by a distance  $2d$ . What is the electric potential at a point P mid-way between them.
- 6. (a) Derive the expression for torque on a current carrying coil in a uniform magnetic field.  
(b) A metal rod of length 25 cm is moving at a speed of  $0.5 \text{ ms}^{-1}$  in a direction perpendicular to 0.25 T magnetic field. Find the emf produced in the rod?
- 7. (a) How an operational amplifier behaves as non-inverting amplifier? Derive a relation for voltage gain of the non-inverting amplifier.  
(b) An alternating source of emf 12 V and frequency 50 Hz is applied to a capacitor of capacitance  $3 \mu F$  in series with a resistor of resistance  $1 \text{ k } \Omega$ . Calculate the phase angle.
- 8. (a) What are the Radiation Detectors? What do you know about "Wilson's cloud chamber"? Explain its principle, construction and working.  
(b) What stress would cause a wire to increase in length by 0.01 % if the Young's modulus of the wire is  $12 \times 10^{10} \text{ Pa}$ . What force would produce this Stress if the diameter of the wire is 0.56 mm.
- 9. (a) What is De-Broglie hypothesis of wave nature of particles? How Davisson and Germer experiment confirmed it?  
(b) Find the speed of electron in the first Bohr orbit.