

Objective  
Paper Code  
8471

FSD

Intermediate Part Second **FBO-41-21**  
**PHYSICS (Objective) GROUP - I**  
Time: 20 Minutes Marks: 17

Roll No. : \_\_\_\_\_  
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Q.No.1 You have four choices for each objective type question as A, B, C and D. The choice which you think is correct, fill the relevant circle in front of that question number on computerized answer sheet. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero marks in that question. Attempt as many questions as given in objective type question paper and leave other circles blank.

S.#	Questions	A	B	C	D
1	Electrical field intensity between two oppositely charged parallel plates is:	$\frac{2\sigma}{\epsilon_0}$	$\frac{\sigma}{\epsilon_0}$	$\frac{\sigma}{2\epsilon_0}$	$\frac{\epsilon_0}{\sigma}$
2	When a dielectric material is inserted between the plates of a capacitor, the potential difference between the plates:	Does not change	Increases	Decreases	Increases then decreases
3	Kirchhoff's first rule is based on law of conservation of:	Mass	Momentum	Energy	Charge
4	Magnetic field strength is measured in terms of:	$\text{Wbm}^{-2}$	Wb	$\text{NmA}^{-1}$	Js
5	In CRO the output waveform of time base generator is:	A ripple	Square wave	Sinusoidal	Saw tooth
6	Mutual inductance of two coils does not depend on:	Number of turns of the coils	Area of cross-section of coils	Density of material of coils	Nature of the core material
7	If the magnetic field intensity is doubled then magnetic energy density becomes:	Four times	Double	Half	Eight times
8	Direct current cannot flow through:	Resistor	Capacitor	Inductor	Ammeter
9	In RLC series circuit, the condition for resonance is:	$X_C > X_L$	$X_C = X_L$	$X_C < X_L$	$X_L = Z$
10	Dimensions of strain are same as that of:	Stress	Pressure	Young's modulus	Relative permittivity
11	Forward resistance of the p-n junction is:	Very large	Of the order of $k\Omega$	A few Ohms	In mega Ohms
12	In a transistor greater concentration of impurity is added in:	Emitter	Collector	Both emitter and collector	Base
13	Value of Plank's constant is:	$6.34 \times 10^{-43} \text{Js}$	$6.43 \times 10^{-34} \text{Js}$	$6.64 \times 10^{-19} \text{Js}$	$6.63 \times 10^{-34} \text{Js}$
14	A gamma radiation has an energy of the order of:	1 MeV	1 keV	100 eV	1 eV
15	Rydberg constant is given in units of:	$\text{kg}^{-1}$	$\text{m}^{-1}$	$\text{s}^{-1}$	Js
16	In a nuclear transmutation, radium changes into radon, the emitted particle is:	A neutron	A proton	An alpha particle	A beta particle
17	The average number of neutrons produced per fission of uranium-235 atom is:	2.5	3	2	4

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FSD

Intermediate Part Second

PHYSICS (Subjective) GROUP - I

Roll No. \_\_\_\_\_

Time: 02:40 Hours

Marks: 68

FSD-41-21

## SECTION - I

## 2. Write short answers to any EIGHT parts.

- (i) Do electrons tend to go to region of high potential or of low potential? 16
- (ii) Define electron volt. Show that  $1 \text{ eV} = 1.60 \times 10^{-19} \text{ J}$
- (iii) Is E necessarily zero inside a charged rubber balloon if balloon is spherical? Assume that charge is distributed uniformly over the surface.
- (iv) What are differences between electric force and gravitational forces?
- (v) How can you use a magnetic field to separate isotopes of chemical element?
- (vi) Why does a picture on a TV screen become distorted when a magnet is brought near the screen?
- (vii) Define the terms magnetic flux and magnetic flux density.
- (viii) Determine the magnitude of force on a charged particle in an electric and magnetic field.
- (ix) Define induced current and induced emf.
- (x) Show that  $\epsilon$  and  $\frac{\Delta\phi}{\Delta t}$  have same units.
- (xi) How the induced current can be increased?
- (xii) Is it possible to change both the area of the loop and magnetic field passing through the loop and still not have an induced emf in the loop?

## 3. Write short answers to any EIGHT parts.

- (i) Describe a circuit which will give a continuously varying potential. 16
- (ii) Explain why the terminal potential difference of a battery decrease when the current drawn from it is increased?
- (iii) What is meant by tolerance? Give example.
- (iv) How does doubling the frequency affect the reactance of an inductor and a capacitor?
- (v) In a R-L circuit, will the current lag or lead the voltage? Illustrate your answer by a vector diagram.
- (vi) Write four properties of parallel resonance circuit.
- (vii) What is meant by hysteresis loss?
- (viii) Define stress and strain. What are their SI units?
- (ix) What are ductile and brittle substances? Give an example of each.
- (x) What is the net charge on a n-type or a p-type substance?
- (xi) How does the motion of an electron in a n-type substance differ from the motion of holes in a p-type substance?
- (xii) What is operational amplifier?

## 4. Write short answers to any SIX parts.

- (i) Which has lower energy quanta? Radiowave or X-ray? 12
- (ii) Why do not we observe Compton effect with visible light?
- (iii) Define work function and give its unit.
- (iv) What are the advantages of laser light over ordinary light?
- (v) Define ionization potential and excitation potential.
- (vi) If a nucleus has half-life of 1 year, does it mean that it will be completely decayed after 2 years? Explain it.
- (vii) What do you mean by term critical mass?
- (viii) Define half-life. Give its expression.
- (ix) Define Hadrons and Leptons.

## SECTION - II

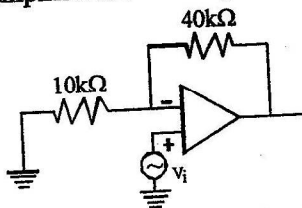
Attempt any THREE questions. Each question carries 08 marks.

5. (a) Explain electric potential at a point due to a point charge. Derive its relation. 05  
 (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  $11 \times 10^{-8} \Omega \text{ m}$  03
6. (a) Determine  $\frac{e}{m}$  of an electron. Derive its relation. 05  
 (b) Two coils are placed side by side. An emf of 0.8V is observed in one coil when current is changing at the rate of  $200 \text{ As}^{-1}$  in the other coil. What is the mutual induction of the coils? 03

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7. (a) Describe the behaviour of an inductor in an A.C. circuit and write expression for reactance of an inductor. 05  
(b) Calculate the gain of non-inverting amplifier shown in figure: 03



8. (a) Describe the formation of energy bands in solids. Explain the difference of electrical behaviour of conductors, insulators and semi-conductors in terms of energy band theory. 05  
(b) A sheet of lead 5.0mm thick reduces the intensity of a beam of  $\gamma$ -rays by a factor of 0.4. Find half value thickness of lead sheet which will reduce the intensity to half of its initial value. 03
9. (a) What is meant by inner shell transition and characteristics X-rays. How X-rays are produced? 05  
Write any two properties and uses of X-rays. 03  
(b) An electron is accelerated through a potential difference of 50V. Calculate its de-Broglie wavelength. 03

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Objective  
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F.S.D

Intermediate Part Second  
**PHYSICS (Objective) GROUP - II**  
Time: 20 Minutes Marks: 17

Roll No.: F30-42-21 ☆

Q.No.1 You have four choices for each objective type question as A, B, C and D. The choice which you think is correct, fill the relevant circle in front of that question number on computerized answer sheet. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero marks in that question. Attempt as many questions as given in objective type question paper and leave other circles blank.

S.#	Questions	A	B	C	D
1	A particle of mass $m$ and charge $q$ is released from rest in a uniform electric field $E$ . The K.E. attained by the particle after moving a distance ' $d$ ' is:	$\frac{Ed}{q}$	$qE^2d$	$qEd$	$\frac{qE}{d^2}$
2	The energy stored in the capacitor is:	K.E.	P.E.	Electrical K.E.	Electrical P.E.
3	On increasing the length of wire specific resistance of the wire:	Increases	Decreases	Remains unchanged	First increase then decrease
4	An electron is moving in a circle of radius ' $r$ ' in a uniform magnetic field, suddenly the field is reduced to $B/2$ , the radius of circle now becomes:	$\frac{r}{2}$	$\frac{r}{4}$	$2r$	$4r$
5	Force on current carrying conductor per unit length is given by:	$ILB \sin \theta$	$ILB$	$IB$	$IB \sin \theta$
6	The current flowing through a coil due to induced emf in it depends upon:	Shape of the coil	Resistance of the coil	Area of the coil	Magnetic flux
7	The induced emf primarily produced at the cost of:	Internal energy	Chemical energy	Electrical energy	Mechanical energy
8	At low frequency the current through a capacitor of A.C. circuit will be:	Large	Small	Zero	Infinite
9	The inductance and capacitance behave a function of:	Voltage	Frequency	Time	Current
10	Impurity atoms are doped in semi-conductor to increase:	Free electrons	Holes	Conductivity	Resistivity
11	The specially designed semi-conductor diode used as indicator lamp in electronic circuit are:	The switch	Solar cells	Photodiodes	Light emitting diode
12	Which diode is used for detection of light?	Light emitting diode	Photo diode	Photo voltaic cell	All these
13	Rest mass of photon is:	Zero	Infinity	$\frac{hf}{c}$	$\frac{hc}{\lambda}$
14	Threshold wavelength for metal having work function $\phi_0$ is $\lambda_0$ . What is threshold wavelength for metal having work function $2\phi_0$ is?	$\frac{\lambda}{2}$	$4\lambda$	$2\lambda$	$\frac{\lambda}{4}$
15	Production of X-rays can be regarded as inverse of:	Compton effect	Photoelectric effect	Annihilation of matter	Pair production
16	The energy released per unit mass is greater in:	Fission reaction	Fusion reaction	Chemical reaction	Nuclear reaction
17	Energy needed to create an electron-hole pair in a solid state detector is:	2 - 3 eV	3 - 4 eV	4 - 5 eV	5 - 6 eV

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ESD

**SECTION - I**

**2. Write short answers to any EIGHT parts.**

- (i) How can you identify that which plate of a capacitor is positively charged? 16
- (ii) Do electrons tend to go to region of high potential or of low potential?
- (iii) State Gauss's law and write its mathematical expression.
- (iv) Give a comparison between electric and gravitational forces.
- (v) Describe the change in magnetic field inside a solenoid carrying a steady current  $I$ , if the number of turns is doubled but the length remains the same.
- (vi) 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?
- (vii) Define magnetic flux density and write its unit.
- (viii) What is Lorentz force? Write its mathematical expression.
- (ix) How would you position a flat loop of wire in a changing magnetic field so that there is no emf induced in the loop?
- (x) Does the induced emf always act to decrease the magnetic flux through a circuit?
- (xi) Write the factors upon which mutual inductance depends.
- (xii) State Faraday's law of electromagnetic induction and write its mathematical expression.

**3. Write short answers to any EIGHT parts.**

- (i) Why does the resistance of a conductor rise with temperature? 16
- (ii) Explain why the terminal potential difference of a battery decreases when the current drawn from it is increased?
- (iii) Differentiate between resistance and resistivity. Also give their units.
- (iv) A sinusoidal current has 'rms' value of 10A. What is the maximum or peak value?
- (v) In R-L circuit, will the current lag or lead the voltage? Illustrate your answer by a vector diagram.
- (vi) At what frequency will an inductor of inductance 1.0H have reactance of 500Ω.
- (vii) What is meant by hysteresis loss? How it is used in the construction of a transformer?
- (viii) Define modulus of elasticity. Show that unit of modulus of elasticity and stress are same.
- (ix) Differentiate between curie temperature and critical temperature.
- (x) Why charge carriers are not present in the depletion region?
- (xi) Why a photo diode is operated in reverse biased region?
- (xii) A transistor has  $I_c = 10\text{mA}$  and  $I_B = 40\text{mA}$ . Calculate the current gain.

**4. Write short answers to any SIX parts.**

- (i) As a solid is heated and begin to glow, why does it first appear red? 12
- (ii) Can pair production take place in vacuum? Explain.
- (iii) What is the energy of photon in a beam of infra-red radiation of wavelength 1240nm?
- (iv) Is energy conserved, when an atom emits a photon of light?
- (v) What is meant by CAT-Scanner?
- (vi) Why are heavy nuclei unstable?
- (vii) Describe a brief account of interaction of various types of radiations with matter.
- (viii) What factors make a fusion reaction difficult to achieve?
- (ix) What is self-quenching in working of GM-Counter?

**SECTION - II**

Attempt any THREE questions. Each question carries 08 marks.

5. (a) Define capacitance. Also derive a relation for capacitance of a parallel plate capacitor for air and dielectric as a medium. 05  
 (b) 0.75A current flows through an iron wire with a battery of 1.5V is connected across its ends. The length of the wire is 5.0m and its cross-sectional area is  $2.5 \times 10^{-7} \text{m}^2$ . Compute the resistivity of iron. 03
6. (a) Derive the relation of  $e/m$  of an electron. 05  
 (b) Two coils are placed side by side. An emf of 0.8V is observed in one coil when the current is changing at the rate of  $200 \text{As}^{-1}$  in the other coil. What is the mutual inductance of the coils? 03
7. (a) What is an operational amplifier? Derive a relation for gain of operational amplifier as inverting amplifier. 05  
 (b) Find the capacitance required to construct a resonance circuit of frequency 1000kHz with an inductor of 5mH. 03
8. (a) Define and explain fusion reaction in detail. 05  
 (b) A 1.0m long copper wire is subjected to stretching force and its length increases by 20cm. Calculate the tensile strain and the percent elongation which the wire undergoes. 03
9. (a) What is de-Broglie hypothesis? How Davisson and Germer verify it? Explain. 05  
 (b) The wavelength of K X-ray from copper is  $1.377 \times 10^{-10} \text{m}$ . What is the energy difference between the two levels from which this transition results? 03