



Name

1۔ ہر سوال کے سامنے چار دائرے دیے گئے ہیں، صرف صحیح جواب والا دائرہ بھریں۔

Roll No

2۔ دائروں کو شیڈ (بھرنے) کے لئے نیلے یا کالے رنگ کا مارکر استعمال کریں۔

3۔ جواب میں ایک سے زائد دائرے بھرنے سے جواب غلط تصور ہوگا۔

Time Allowed: 20 Minutes

SECTION - A

Marks : 18

- 1 The potential difference between two oppositely charged plates is 12V. if the plates are separated by 3 cm, the electric field between the plates will be:
- 2 The electric flux through a closed surface does not depends on:
- 3 A dielectric is inserted between the plates of a charged capacitor, the electric field in the region between the plates:
- 4 A wire is stretched to double its length keeping its volume constant, the electrical resistance of the wire:
- 5 The working principle of thermocouple is based on:
- 6 A 100 cm long wire carrying 5A current placed at an angle of 45° in a uniform magnetic field of 4T will experience magnetic force of:
- 7 The iron core used in transformer is laminated to:
- 8 The impedance of an RLC series A.C circuit in resonance is: 283
- 9 If the frequency of A.C source in a purely capacitive circuit is decreased, the current in the circuit will:
- 10 If stress is increased within the elastic limit of a material, strain:
- 11 A wire is stretched by hanging a mass from its free end. If the hanging mass is doubled and the radius of the wire is also doubled, the extension produced in the wire will:
- 12 The solid materials whose constituent particles don't possess a regular orderly arrangement are:
- 13 The depletion layer in a PN junction diode is caused by the:
- 14 Two stars A and B radiate maximum energy at 3600 A° and 4800 A° respectively. The ratio of absolute temperatures of A and B is:
- 15 The phenomenon which demonstrates particle nature of electromagnetic radiation is:
- 16 When an electron in a hydrogen atom jumps from the 4th orbit to 2nd orbit, the spectral line obtained is:
- 17 If the accelerating voltage applied to electrons in an x-ray tube is increased from V to 4V, the minimum wavelength in the spectrum of continuous x-rays:
- 18 If $T_{1/2}$ is the half-life of a radioactive substance, its activity reduces to $1/8^{\text{th}}$ of its initial activity in time interval of:
- Options for Q1: ☐ 400 N/C ☐ 600 N/C ☒ 800 N/C ☐ 1000 N/C
- Options for Q2: ☐ Net charge enclosed by the surface ☐ Medium around the charge ☐ Both net charge and medium ☒ Shape and size of the surface
- Options for Q3: ☐ Increases ☒ Decreases ☐ Remains constant ☐ Becomes zero
- Options for Q4: ☐ is doubled ☐ is halved ☐ is quadrupled ☒ Remains constant
- Options for Q5: ☐ Ohm's law ☐ Ampere's law ☐ Thomson effect ☒ Seebeck effect
- Options for Q6: ☐ 5.14 N ☒ 10.14 N ☐ 14.14 N ☐ 20.14 N
- Options for Q7: ☐ Increase the magnetic field ☐ Reduce flux loss in air ☐ Reduce residual magnetism ☒ Reduce heating effect of eddy currents
- Options for Q8: ☐ Minimum and equal to R ☐ Minimum and equal to X_L ☒ Maximum and equal to X_C ☐ Minimum and equal to X_C
- Options for Q9: ☒ Increase ☐ Decrease ☐ Remain constant ☐ Stop to flow
- Options for Q10: ☒ Remains constant ☐ Decreases ☐ Increases proportionally ☐ Becomes zero
- Options for Q11: ☐ Increase ☒ Decrease ☐ Remain the same ☐ Become zero
- Options for Q12: ☐ Copper and aluminum ☐ Sugar and rock salt ☐ Gold and silver ☒ Glass and rubber
- Options for Q13: ☐ Drift of holes ☐ Drift of electrons ☐ Migration of impurity ions ☒ Diffusion of charge carries across junction
- Options for Q14: ☐ 4 : 3 ☐ 3 : 4 ☒ 9 : 16 ☐ 16 : 9
- Options for Q15: ☐ Interference of light ☐ Diffraction of light ☒ Polarization of light ☐ Photoelectric effect
- Options for Q16: ☐ First line of Paschen series ☐ Second line of Balmer series ☐ First line of Balmer series ☒ Second line of Paschen series
- Options for Q17: ☐ Shifts toward larger value. ☐ Shifts towards smaller value ☒ Remains at the same value ☐ Becomes zero
- Options for Q18: ☒ $2T_{1/2}$ ☐ $3T_{1/2}$ ☐ $4T_{1/2}$ ☐ $8T_{1/2}$

Section – B

Marks: 40

Attempt any TEN parts. Each part carries FOUR marks.

- Q.1 State Ohm's law and write its mathematical form. Why does the filament of an electric bulb not obey Ohm's law? Justify your answer with the help of the I-V curve for bulb filament. 1+1+2
- Q.2 State the working principle of Wheatstone bridge to measure an unknown resistance. Why is the electric current through a balanced Wheatstone bridge zero? 2+2
- Q.3 A coil of 1000 turns has electrical resistance of 50Ω . The magnetic flux linked with it increases from 5×10^{-3} Wb to 8×10^{-3} Wb in 0.02s. Calculate the magnitude of induced current in it. 1+1+1+1
- Q.4 Define the following terms: 1+1+1+1
(i) self-inductance (ii) mutual inductance (iii) Henry (iv) transformer
- Q.5 What is back e.m.f? Why is the back e.m.f produced in electric motors? Name the two factors affecting the magnitude of the back e.m.f in motors. 1+1+2
- Q.6 What is stress-strain curve? Differentiate between ductile and brittle materials by drawing a stress-strain curve for a typical metal. 1+3
- Q.7 Define p-type semiconductor. Why is the number of holes more than the number of electrons in a p-type of semiconductor? 1+3
- Q.8 Given that the constant α of a transistor is 0.96, calculate the change in collector current corresponding to a change of 0.5 mA in the base current in a common emitter configuration. 1+1+1+1
- Q.9 Calculate the shortest wavelength of the line emitted in the pfund series of hydrogen atom spectrum. ($R_H = 1.0974 \times 10^7 \text{ m}^{-1}$). 1+1+1+1
- Q.10 State the three postulates of Bohr's atomic theory of hydrogen atom. What is the origin of the emission line spectrum of the hydrogen atom? 1+1+1+1
- Q.11 What is nuclear reactor? State its working principle. How do control rods keep nuclear reactor in critical state? 1+1+1+1
- Q.12 A sample of carbon-14 has a decay constant of 1.21×10^{-4} per year. Calculate its half-life in years. 1+1+1+1
- Q.13 Why does a nucleus emit gamma radiation? Write the general equation of gamma decay. What is the effect on the atomic number and mass number of a nucleus when it undergoes gamma decay? 2+1+1

Section – C

Marks: 27

Note: Attempt any THREE questions. All questions carry equal marks.

- Q.14 (a) State Coulomb's law. Derive the mathematical expression for the magnitude of electric field intensity at a distance 'r' from a point charge 'q'. 2+3
(b) Two capacitors of capacitances $10\mu\text{F}$ and $20\mu\text{F}$ are connected in parallel across a battery of voltage 90V. Calculate the: 1+1+1+1
(a) equivalent capacitance of the combination. (b) charge stored on each capacitor
- Q.15 (a) State Ampere's law. Using Ampere's law, show that the magnetic field inside an idea solenoid of turns density 'n' carrying current 'I' is given by $B = \mu_0 nI$. 1+1+1+1
(b) State the four factors that affect the magnitude of the force acting on a charged particle moving in a magnetic field. 1+1+1+1
- Q.16 (a) What is the condition for an RLC series AC circuit to be in resonance? Determine the formula resonant frequency of an RLC circuit from this condition. What is the impedance of the circuit in resonance? 1+3+1
(b) The RMS values of voltage and current in an AC circuit are 200 V and 0.5 A respectively. If the power factor of the circuit is 0.6, calculate the power consumed by the circuit. 1+1+1+1
- Q.17 (a) What is de-Broglie hypothesis? Describe the experiment of Davisson and Germer to confirm de-Broglie hypothesis of wave nature of particles. 1+4
(b) Define the following terms: 1+1+1+1
(i) photoelectric effect (ii) Compton effect (iii) pair production (iv) pair annihilation