NAVODAYA VIDYALAYA SAMITI
REGIONAL OFFICE , JAIPUR
Term – 1 Examination (2025-26)

Class – XII **Subject – Physics (042)**
Time:- 03 hours **Max. Marks – 70**

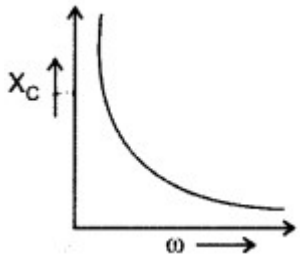
MARKING SCHEME

Section A – MCQs & Assertion Reason (Q1 to Q16)
(1 mark each)

Q. No	Answer	Marks
Q1	(b)	1
Q2	(c)	1
Q3	(c)	1
Q4	(b)	1
Q5	(b)	1
Q6	(c)	1
Q7	(C)	1
Q8	(d)	1
Q9	(c)	1
Q10	(a)	1
Q11	(c)	1
Q12	(b)	1
Q13	(a)	1
Q14	(a)	1
Q15	(c)	1
Q16	(a)	1

Total: 16 marks

Section B – Short Answer (2 Marks Each)

Q. No	Key Points	Marks
Q17	Graph showing a variation of xc capacitive reactance with the change in frequency of AC source. $X_C = 1/\omega C$ 	1+1
Q18	(i) Q = CV (C_total = 10 μF), Q = 120 μC; (ii) U = ½CV² = 0.72 mJ	1+1
Q19	New resistance = 4 × original = 40 Ω (length ×2 ⇒ area ÷4)	2

Q. No	Key Points	Marks
OR	Drift velocity ∝ 1/A; increasing A ⇒ decrease in drift velocity (with constant I)	2
Q20	$F = \frac{\mu_0}{2\pi}\frac{I_1 I_2}{r}$ One ampere of current is the value of steady current, which when maintained in each of the two very long, straight, parallel conductors of negligible cross-section; and placed one metre apart in vacuum, would produce on each of these conductors a force of equal to 2 × 10-7 newtons per metre (Nm-1) of length.	1+1
Q21	(a) Proper field lines between two like charges, (b) Concentric circles around point charge.	1+1

Total: 10 marks

Section C – Short Answer (3 Marks Each)

Q. No	Key Points	Marks
Q22	$C = \varepsilon_O KA/d$, derivation with dielectric included	3
Q23	Kirchhoff's laws stated. Consider the loop EFCBE and apply KVR, we get $1I_2 + 3I_1 + 2I_1 = 9$ $5I_1 + I_2 = 9$ …(1) Applying KVR to the loop EADFE, we get $3 (I_1 – I_2) – 1I_2 = 6$ $3I_1 – 4I_2 = 6$ …(2) By solving equation (1) and (2), we get I1 = 1.83 A and I2 = -0.13 A The negative sign implies that the current in the 1-ohm resistor flows from F to E.	1+2
Q24	Principle of conversion, formula: V = Ig(G + R), R = 2950 Ω	1+2
Q25	(i) Z = 20 Ω, (ii) X_L = 19.36 Ω, (iii) L = 61.6 mH	1+1+1
OR	Derivation of I = V/Z, phasor diagram	2+1

Q. No	Key Points	Marks
Q26	(i) emf induced $e = Blv = (0.1) \times (10 \times 10^{-2}) \times 20 \text{ V} = \mathbf{0.2\ V}$ (ii) Current in the loop, $i = \frac{e}{R} = \frac{0.2}{2} = \mathbf{0.1\ A}$	1.5+1.5
Q27	3 differences + 1 example each: para (Al), dia (Bi), ferro (Fe)	3
Q28	(a) The equation Ey = 0.5 cos $\left[2\pi \times 10^8 (t - x/c)\right]$ Represents wave is propagating along + x – axis (b) Comparing equation with the standard one Ey = EO cos w $(t - x/c)$ $w = 2\pi \times 10^8$ $2\pi v = 2\pi \times 10^8$ $v = 10^8$ $\Rightarrow \lambda = \frac{c}{v} = \frac{3 \times 10^8}{10^8}$ $\lambda = 3m$ (c) Associated magnetic field is $\perp$ to electric field and the direction of propagation. Since wave is propagating along x – axis, electric field is along, y – axis Thus, magnetic field is along z – axis $\Rightarrow Bx = 0, By = 0$ $Bz = B_O \cos[2\pi \times 10^8 (t - x/x)]$ $Bz = \frac{E_O}{c} \cos 2\pi \times 10^8 (t - x/x)]$	1+1+1

Total: 21 marks

Section D – Case Study (4 Marks Each)

Q29. Alternating Current

Q29.ANSWERS : CASE STUDY BASED QUESTIONS

(i) d (ii) c (iii) d (iv) c OR c

Q30. Electromagnetic Waves

Q30 1. (c) Displacement current contributes to the total current in circuits with changing electric fields.

2. (c) It increases due to faster changes in the electric field.

3. (b) To ensure continuity in Ampere's law for time-varying electric fields.

4. (b) It maintains current flow even when the capacitor is fully charged.

OR

(b) It accounts for the changing electric field between the plates, allowing us to apply Ampère's law in regions where there is no conduction current.

Total: 8 marks

Section E – Long Answer (5 Marks Each)

Q31. Mutual Inductance

Part	Marks
Definition + expression	1+2
Factors	2

OR

AC Generator

Part	Marks
Principle, Diagram , EMF Expression	1+0.5+1.5
Function of brushes	1
Role of slip rings	1

Q32. Force between two current carrying conductors.

Part	Marks
Force of attraction per unit length on two parallel wires carrying current in same direction are attractive in nature.	1
$F/l = \frac{\mu_0}{4\pi}\frac{2I_1I_2}{r} = 10^{-7} \times \frac{2\times 8\times 5}{4\times 10^{-2}}$ $= 20 \times 10^{-5}\ \text{N m}^{-1}$ Attractive force on 10 cm section of wire A $F = [20 \times 10^{-5}][10 \times 10^{-2}] = 2 \times 10^{-5}\ \text{N}$	1+2+1

OR

Defination of Biot-Savart Law . Derivation on axis of loop with figure → Final result 1+2+2

Q33. Gauss's Law

Part	Marks
(I) Statement & derivation .Application: infinite plane sheet	3
(II) net force caused by the four charges placed at the corner of the square on 1 μC charge at centre O is zero.	2

OR

Defination , Electric potential derivation, graph of V vs. R 1+3+1

Total: 15 marks

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LEARNING OUTCOME

Section – A (1 mark each)

LO 1. Application of physics formulas to real-world situations → *Problem-Solving Skills*
LO 2. Recalling factual scientific knowledge → *Memory & Recall Skills*
LO 3. Applying formula for series combination → *Analytical Thinking*
LO 4. Understanding experimental conditions → *Conceptual Understanding*
LO 5. Recognising field behaviour in physical systems → *Scientific Literacy*
LO 6. Analysing current patterns → *Critical Thinking*
LO 7. Using Kirchhoff's laws to interpret circuits → *Logical Reasoning*
LO 8. Understanding instrument limitations → *Scientific Reasoning*
LO 9. Matching technology with science concepts → *Application Skills*
LO 10. Calculating values from given data → *Numerical Ability*
LO 11. Applying Lenz's law to predict outcomes → *Cause–Effect Reasoning*
LO 12. Computing energy storage in devices → *Quantitative Problem-Solving*
LO 13. Relating diagram rules to physical logic → *Critical Reasoning*
LO 14. Explaining scientific phenomena → *Conceptual Clarity*
LO 15. Understanding device modification → *Applied Science Skills*
LO 16. Identifying limitations of laws → *Analytical Reasoning*

Section – B (2 marks each)

LO 17. Interpreting scientific graphs → *Data Interpretation Skills*
LO 18. Performing sequential calculations → *Numerical & Analytical Skills*
LO 19. Relating physical property changes → *Analytical Problem-Solving*
LO 20. Connecting definitions to physical phenomena → *Conceptual Understanding*
LO 21. Visual representation of abstract ideas → *Spatial Reasoning*

Section – C (3 marks each)

LO 22. Derivation from first principles → *Mathematical Modelling Skills*
LO 23. Applying laws to complex systems → *Higher-Order Thinking*
LO 24. Device conversion with calculation → *Practical Application Skills*
LO 25. Solving multi-step AC problems → *Analytical & Problem-Solving Skills*
LO 26. Relating motion to induced effects → *Cause–Effect Analysis*
LO 27. Comparing and classifying materials → *Comparative Analysis Skills*
LO 28. Understanding wave properties → *Integration of Concepts*

Section – D (4 marks each)

LO 29. Choosing optimal configurations → *Decision-Making Skills*
LO 30. Linking theory to experimental evidence → *Scientific Inquiry Skills*

Section – E (5 marks each)

LO 31. Deriving and explaining technical concepts → *Advanced Analytical Thinking*
LO 32. Applying laws to real-world force calculations → *Applied Physics Skills*
LO 33. Using electrostatics principles in problem-solving → *Integration & Problem-Solving Skills*