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(FOR THE CANDIDATES ADMITTED

SUBJECT CODE

24 UPS 405

DURING THE ACADEMIC YEAR 2024-25 ONLY)

REG.NO.:

N.G.M.COLLEGE (AUTONOMOUS) : POLLACHI

END-OF-SEMESTER EXAMINATIONS : MAY- 2026

B.Sc. – PHYSICS

MAXIMUM MARKS: 75

IV SEMESTER

TIME : 3 HOURS

PART – III

ELECTRICITY & MAGNETISM

SECTION – A

(10 X 1 = 10 MARKS)

ANSWER THE FOLLOWING QUESTIONS.

(K1)

- The relation between electric field (E) and electric potential (V) is given by
 - $E = \nabla V$
 - $E = -\nabla V$
 - $E = \nabla^2 V$
 - $E = -\nabla^2 V$
- When a dielectric is placed between the plates of a capacitor, the capacitance
 - increases
 - decreases
 - remains the same
 - becomes zero
- A Ballistic Galvanometer is used to measure
 - inductance
 - voltage
 - amount of charge flow
 - resistance
- Lenz's Law is a consequence of the law of conservation of
 - charge
 - momentum
 - mass
 - energy
- The velocity of electromagnetic waves in a vacuum is given by
 - $\mu_0 \epsilon_0$
 - $\sqrt{\mu_0 \epsilon_0}$
 - $1/\sqrt{\mu_0 \epsilon_0}$
 - $1/\mu_0 \epsilon_0$

ANSWER THE FOLLOWING IN ONE (OR) TWO SENTENCES

(K2)

6. Define electrostatic potential.
7. What is meant by the "Guard Ring" in a capacitor?
8. Write the Gauss's Law in Magnetostatics.
9. State Faraday's First Law of induction.
10. Give the physical significance of the Poynting Theorem.

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SECTION – B

(5 X 5 = 25 MARKS)

ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS. (K3)

11. a) Derive the expression for the potential due to an electric dipole at any point.
(OR)
b) Explain the concept of equipotential surfaces and list their properties.
12. a) Derive an expression for the energy stored in a charged parallel plate capacitor.
(OR)
b) Distinguish between polar and non-polar molecules with examples.
13. a) Calculate the interaction force between two long parallel wires carrying currents.
(OR)
b) Use Ampere's Law to find the magnetic field inside a long solenoid.
14. a) Derive expression for the growth of current in a series RL circuit connected to a DC source.
(OR)
b) Discuss the energy stored in two interacting circuits.
15. a) Write Maxwell's equations in integral form for free space.
(OR)
b) Discuss the concept of Vacuum Displacement Current.

SECTION – C

(5 X 8 = 40 MARKS)

ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS.

16. a) Derive the expression for the electric field and potential at a point due to a uniformly charged disc.
(OR)
b) Discuss the potential energy due to a continuous charge distribution. (K4)
17. a) Derive the expression for the capacitance of a parallel plate capacitor partially filled with a dielectric slab of thickness 't'.
(OR)
b) Explain the physical meaning and mechanism of polarization. (K4)
18. a) Using Biot-Savart's law, derive an expression for the magnetic field due to a long straight current carrying wire.
(OR)
b) Describe the construction and working of a moving coil Ballistic Galvanometer. (K5)
19. a) Elaborate the charging and discharging of a capacitor through a resistor (RC circuit).
(OR)
b) Discuss the theory of the LCR series circuit. (K5)
20. a) Derive Maxwell's four equations in differential form.
(OR)
b) Derive the expression for energy density of an electromagnetic wave in terms of E and B. (K4)

