

24U115

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Name :

Reg. No :

FIRST SEMESTER UG DEGREE EXAMINATION, NOVEMBER 2024

(FYUGP)

CC24U PHY1 MN104 - ELECTRICITY AND MAGNETISM

(B.Sc. Physics - Minor Course)

(2024 Admission - Regular)

Time: 2.0 Hours

Maximum: 70 Marks

Credit: 4

Part A (Short answer questions)

Answer *all* questions. Each question carries 3 marks.

1. Explain the significance of the direction of electric field lines in understanding the nature of electric fields. [Level:2] [CO1]
2. Explain the relationship between electric force and electric field. How is the force on a test charge related to the electric field? [Level:2] [CO1]
3. Define electric charge and explain its basic properties. [Level:2] [CO1]
4. Discuss how an isolated charge placed in the cavity of a charged conductor affects. [Level:2] [CO2]
5. Illustrate the electric field on the surface containing a positive and negative charge. [Level:2] [CO2]
6. Describe the setup of Faraday's icepail experiment .What are the key components involved. [Level:2] [CO2]
7. Solve for the total resistance of a circuit that has resistors in series and parallel combinations. [Level:3] [CO3]
8. Explain the concept of electromotive force (EMF) and describe how it differs from potential difference in a circuit. [Level:2] [CO3]
9. Calculate the power dissipated in a resistor when a known current flows through it. [Level:3] [CO3]
10. Discuss the significance of the right-hand rule to determine the direction of the magnetic force on a positive charge? [Level:2] [CO4]

(Ceiling: 24 Marks)

Part B (Paragraph questions/Problem)

Answer *all* questions. Each question carries 6 marks.

11. If the torque on an electric dipole in a uniform electric field is measured to be 0.001 N m and the dipole moment is $4 \times 10^{-6} \text{ C m}$, find the angle at which the dipole is oriented with respect to the electric field. [Level:1] [CO1]

12. If the distance between two charges $q_1=5\text{ C}$ and $q_2=10\text{ C}$ is reduced by half, infer how does the electrostatic force between them change? [Level:2] [CO1]
13. Considering the electric field of a point charge located at the center of a spherical surface and determine the expression for electric flux through that surface. [Level:3] [CO2]
14. Discuss the scenarios by comparing the electric flux when the box is empty versus when it contains equal positive and negative charges. [Level:2] [CO2]
15. Discussing with the term Electric Potential show how it satisfies work-energy theorem. [Level:2] [CO2]
16. An 18 gauge copper wire has a nominal diameter of 1.02 mm. This wire carries a constant current of 1.67A to 200-watt lamp. The density of free electrons is 8.5×10^{28} electrons per cubic meter. Find the magnitudes of A). the current density B). the drift velocity. [Level:1] [CO3]
17. Infer that for Long distance, electric-power, transmission lines always operate at very high voltage, sometimes as much as 750 kv. what are the advantages of such high voltages. what are the disadvantages. [Level:1] [CO3]
18. Explain the concept of a magnetic monopole and What does Gauss's law for magnetism say about the existence of magnetic monopoles? [Level:2] [CO4]

(Ceiling: 36 Marks)

Part C (Essay questions)

Answer any *one* question. The question carries 10 marks.

19. Compute Electric potential due to a) two point charges b) Several point charges. c) Discuss the behaviour of both [Level:3] [CO2]
20. Explain the terms drift velocity, conventional current and current density and derive the expression for current density. [Level:2] [CO3]

(1 × 10 = 10 Marks)
