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Daffodil International University

Faculty of Science & Information Technology
Department of Computer Science & Engineering
Midterm Examination, Fall 2025
Course Code: PHY102, Course Title: Physics II
Level: 1 Term: 3 Batch: 68

Time: 01:30 Hrs **Marks: 25**

Answer ALL Questions

[The figures in the right margin indicate the full marks and corresponding course outcomes. All portions of each question must be answered sequentially.]

1.	*a)*	**Identify** the limitations of Coulomb's Law.	1	CO1
	b)	**State** Ampère's Law.	1	
	c)	**Relate** drift velocity with current density.	1	
	d)	**Recall** the concept "Lorentz Force".	1	
	e)	**Distinguish** between resistivity and conductivity.	1	
2.	*a)*	A father teaches his daughter how to protect sensitive equipment from high current by using a low resistance in parallel. **Explain** how this protects the equipment and **determine** the current flowing through the low resistance.	3	CO2
	b)	An engineer is designing a touch sensor using two flat metal plates placed parallel to each other with a thin insulating layer in between. **Demonstrate** the capacitance of this type of capacitors.	3	
	c)	During an electronics workshop, a technician notices that a compass needle deflects near a long, straight current-carrying wire. Using the Biot–Savart law, **derive** the expression for the magnetic field at a distance r from the wire carrying a steady current I.	4	
3.	*a)*	A copper wire of cross-sectional area $1\,mm^2$ carries a current of 10 A. If the number of free electrons per cubic meter is 1×10^{28}, determine a) the drift velocity of the electrons, and b) the current density.	2.5	CO3
	b)	A large, non-conducting sheet carries a uniform surface charge density of $\sigma = 3 \times 10^{-6}\ C/m^2$. a) Calculate the electric field intensity near the surface of the sheet. b) If a test charge of $q = 2 \times 10^{-9}$ C is placed at some distance from the sheet, determine the magnitude of the electrostatic force acting on it.	2.5	
	c)	The magnetic flux through a flat surface of area $40\ cm^2$ in a uniform magnetic field of 1.2 T is 2.4×10^{-3} Wb. What is the angle (in radians) between the plane and the magnetic field?	2.5	
	d)	The primary coil of a transformer has 200 turns and is connected to a 120 V supply. If the secondary coil has 800 turns, determine the secondary voltage.	2.5	