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Daffodil International University

Faculty of Science & Information Technology
Department of Computer Science & Engineering
Midterm Examination, Fall 2026
Course Code: PHY102, Course Title: Physics II
Level: 1 Term: 3 Batch: 71

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)*	Write Gauss's law for the electric flux through a closed surface.	1	CO1
	b)	Recall the relationship between charge density and drift velocity.	1	
	c)	Define the magnetic moment of a current-carrying loop and state its SI unit.	1	
	d)	Explain the physical significance of μ.	1	
	e)	State Lenz's law and indicate the direction of induced current.	1	
2.	*a)*	In a molecular system, two equal and opposite charges, $+q$ and $-q$, are separated by a small distance d. Point X is located at a distance from the charges. Obtain an expression for the electric potential at X.	3	CO2
	b)	You find a capacitor in the physics laboratory shaped like a coaxial cable, consisting of two conducting cylindrical surfaces separated by an insulating medium. Establish the expression for its capacitance.	4	
	c)	A thin metallic strip carrying a current I is placed in a uniform magnetic field perpendicular to the direction of charge motion. A Hall voltage V_H develops across the strip. By balancing the electric and magnetic forces, derive an expression for the number of charge carriers per unit volume in terms of the measurable quantities.	4	
3.	*a)*	Two fixed point charges of +4 μC and +1 μC are placed 30 cm apart on a laboratory bench. A small test charge is placed on the line joining them. Determine the position where the test charge experiences zero net electrostatic force.	2.5	CO3
	b)	The resistances of the four arms of a post office box are P = 10 Ω, Q = 10 Ω, R = 20 Ω and S = 25 Ω, respectively. What amount of resistance, when connected in parallel with S, will balance the post office box?	2.5	
	c)	A straight wire carrying a current of 4 A is placed near a point P. The point lies 5 cm perpendicular to the wire. The two lines joining P to the ends of a finite wire segment make angles of 30° and 60° with the wire. Draw the diagram and calculate the magnitude of the magnetic field at P due to the wire segment.	2.5	
	d)	A transformer converts an input voltage of 220 V to an output voltage of 2200V. If the primary coil has 500 turns and a resistance of 0.5 Ω, estimate the number of turns in the secondary coil and identify the type of transformer.	2.5	

$\sqrt[9]{Good\ Luck}$