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Daffodil International University

Faculty of Science & Information Technology

Department of Computer Science and Engineering

Midterm Examination, Spring-2026

Course Code: PHY102, Course Title: Physics-II

Level: 01 Term: 03 Batch: 69

Time: 1 Hour and 30 Minutes **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)	State Coulomb's law and relate it for a dielectric medium.	2	CO-1
	(b)	List the differences between self-inductance and mutual inductance?	2	
	(c)	Describe how drift velocity changes when charge carrier density decreases.	1	
2.	(a)	In an underground cable fault-detection setup using a Wheatstone bridge, an unknown resistance X is compared with known resistances P, Q,and R. A galvanometer is connected across the bridge. Using Kirchhoff's laws, derive the condition for balance of the Wheatstone bridge.	4	CO-2
	(b)	In modeling charged transmission wires, an infinite uniformly charged rod is often assumed. Using Gauss's law, determine the electric field and electric flux near the rod.	3	
	(c)	Circular current-carrying loops are used in devices such as galvanometers and magnetic sensors. If the wire has 35 identical loops, applying the Biot–Savart law, compute the magnetic field at the center of the loops.	3	
3.	(a)	Two point charges, $q_1 = +3\ \mu C$ and $q_2 = -2\ \mu C$, are separated by 0.12 m. Find the point along the line joining them where the electric field is zero.	2.5	CO-3
	(b)	A rectangular frame of dimensions $0.2\ m \times 0.3\ m$ is placed in a uniform magnetic field of magnitude $B = 0.5\ T$. The plane of the frame makes an angle $\theta = 30°$with the direction of the magnetic field. Calculate the magnetic flux through the frame.	2.5	
	(c)	A spherical capacitor has two concentric conducting shells of radii $R_1 =$ 5 cmand $R_2 = 10$ cm. The space between the shells is filled with a dielectric of permittivity $\varepsilon_0 = 8.85 \times 10^{-12}\ F/m$. Calculate the capacitance of the spherical capacitor.	2.5	
	(d)	A step-up transformer has a turn ratio of 1:10. The primary voltage is 120 V and the load on the secondary draws 2 A. Calculate the secondary voltage.	2.5	