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Daffodil International University

Faculty of Science & Information Technology

Department of Computer Science and Engineering

Final Examination, Spring-2026

Course Code: PHY102, Course Title: Physics-II

Level: 01 Term: 03 Batch: 69

Time: 2 Hour **Marks: 40**

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 the concept of the De Broglie hypothesis and write its expression.	1	CO-1
	(b)	State what is meant by an inertial frame of reference and give any example.	1	
	(c)	Define binding energy. Then, sketch and explain the curve of binding energy per nucleon as a function of mass number.	2	
	(d)	What type of reaction occurs in a nuclear reactor? Briefly explain the process.	2	
	(e)	State the limitations of Galilean Transformation.	2	
	(f)	Differentiate between the Photoelectric Effect and the Compton Effect.	2	
2.	(a)	Summarize the key postulates of the Bohr atomic model. How does it modify the limitations of the Rutherford atomic model?	4	CO-2
	(b)	Following the radioactive decay process, (i)Derive the radioactive decay law and (ii)Obtain the expression for half-life.	3	
	(c)	Describe the concept of length contraction and derive the relation between proper length and contracted length using the postulates of the Special Theory of Relativity.	3	
	(d)	A high-energy photon collides with a free electron initially at rest. After the interaction, the photon is scattered at an angle with a longer wavelength. a) Explain the phenomenon of Compton Effect. b) Using conservation of energy and momentum, obtain the expression for the wavelength shift of the photon.	1+4	

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3.	(a)	Find the binding energy and binding energy per nucleon of $^{238}_{92}U$ nucleus in MeV unit. Given: proton mass = 1.007276 u, neutron mass = 1.008665 u, and nuclear mass = 238.05078 u.	3	CO-3
	(b)	Two elements "X" and "Y" have half-lives of 6 days and 9 days respectively. Evaluate the time required for each to reduce to 10% of its initial amount.	3	
	(c)	A woman aged 28 travels in a spacecraft at a speed of 0.95c, leaving her 6-year old daughter on Earth. She spends 20 years in space. After returning, find the ages of both the mother and the daughter.	3	
	(d)	An electron moves with velocity of v = 0.8c. Using the concept of relativistic mass, calculate: a) The relativistic mass of the electron. b) The percentage increase in its mass compared to its rest mass.	3	
	(e)	Using uncertainty principle, determine the minimum velocity of an electron needs to have to be inside a nucleus.	3	

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