Daffodil International University

Faculty of Science & Information Technology
Department of Computer Science & Engineering
Final Semester Examination, Fall 2024
Course Code: PHY102, Course Title: Physics II
Level: 1 Term: 2 Batch: 66

Time: 2:00 Hrs. **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)*	Define nuclear binding energy.	1	CO1
	b)	Identify what occurs during alpha decay in a radioactive atom.	1	
	c)	Distinguish between nuclear fission and fusion reactions.	2	
	d)	Describe Heisenberg's uncertainty principle.	2	
	e)	Outline the Compton effect with a proper diagram.	2	
	f)	Write down the postulates of the theory of relativity.	2	
2.	*a)*	Demonstrate why an electron cannot exist within the nucleus.	3	CO2
	b)	Explain the significant observations from various atomic models that illustrate the structure of the atom.	4	
	c)	State Lorentz transformation and calculate time dilation using Lorentz transformation.	4	
	d)	From radioactive decay law show that $N = N_o e^{-\lambda t}$, where the symbols have their usual meanings.	4	
3.	*a)*	Find the mass defect, binding energy and binding energy per nucleon of $^{62}_{28}Ni$ nucleus. Given that, atomic mass of hydrogen = 1.007825u. Mass of a neutron = 1.008665u and atomic mass of nickel = 61.928348u.	3	CO3
	b)	Calculate the maximum kinetic energy of the electron emitted from a metal surface when light of wavelength 2400Å incident on it. The work function of metal surface is 2.3eV.	3	
	c)	An astronaut, at the age of 30 years, went to investigate the Milky Way by a spaceship moving with a speed of 2.4×10^8 ms^{-1} and returned after 50 years (according to the calendar of the earth). What will be his age?	3	
	d)	The half-life of a radioactive material is 15 hours. If the initial mass of that material is 4g then after 60 hours how much of that material will remain unchanged?	3	
	e)	Determine the de Broglie wavelength of an electron moving with a velocity of $v = 1.8 \times 10^7$ m/s.	3	