

**Fourth Semester Internal Examination, February 2026**  
**Major Course in PHYSICS**  
**PHY4CJ 205 - Modern Physics**

Time: 1 Hr

Max Marks: 35

Name:	Marks Scored	Section A		Total Marks
Class:		Section B		
Roll No.		Section C		

**Section A**

(Each question carries 3 marks, Max marks for section – 7 marks)

1. Give the Einstein's Postulates for Special theory of Relativity.
2. Explain the twin paradox.
3. What is Compton effect?

**Section B**

(Each question carries 6 marks, Max marks for section – 18 marks)

4. A proton is moving with a speed equal to a fraction of the speed of light. If the speed of the proton is given by  $v=0.78c$ , determine the relativistic momentum of the proton.
5. In a Michelson-Morley type experiment, what is the minimum arm length required to detect a fringe shift of 0.2, assuming the velocity of the apparatus is  $3.3 \times 10^4$  m/s and the wavelength of light is 600nm?
6. X-rays of wavelength  $\lambda=0.24$ nm are Compton-scattered, and the scattered beam is observed at an angle of  $\theta=60.0^\circ$  relative to the incident beam. Find:
  - (a) the wavelength of the scattered X-rays,
  - (b) the energy of the scattered X-ray photons,
  - (c) the kinetic energy of the scattered electrons,
  - (d) the direction of travel of the scattered electrons.
7. A distant galaxy is moving away from the Earth at such high speed that the blue hydrogen line at a wavelength of 434 nm is recorded at 600 nm, in the red range of the spectrum. What is the speed of the galaxy relative to the Earth?

**Section C**

(Answer **any one** question, Each question carries 10 marks)

8. Describe the Michelson-Morley experiment with a neat diagram. Explain the objective, experimental setup, and the negative result. What is the physical significance of this result?
9. What is Compton effect ? Derive the expression for shift in the wave length ? Write the salient features of Compton effect.

\* Tie the question paper along with the answer script