PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION MAY 2025
(Fifth Semester)

Branch – **PHYSICS**

QUANTUM MECHANICS AND RELATIVITY

Time: Three Hours Maximum: 50 Marks

SECTION-A (5 Marks)
Answer **ALL** questions
ALL questions carry **EQUAL** marks (5 x 1 = 5)

1 The Photoelectric effect can be explained on the basis of
(i) Corpuscular theory (ii) Wave theory
(iii) electromagnetic theory (iv) quantum theory

2 Which of the following is a correct relation according to Heisenberg's uncertainty principle.
(i) $\Delta x \times \Delta P \leq \frac{h}{4\pi}$ (ii) $\Delta x \times \Delta v \leq \frac{h}{4\pi}$
(iii) $\Delta x \times \Delta P \geq \frac{h}{4\pi}$ (iv) $\Delta x \times \Delta v \geq \frac{h}{4\pi}$

3 The compact from of Schrodinger wave equation is
(i) $i\hbar\frac{d\Psi}{dt} = H\Psi$ (ii) $i h\frac{d\Psi}{dt} = H\Psi$
(iii) $\hbar\frac{d\Psi}{dt} = H\Psi$ (iv) $h\frac{d\Psi}{dt} = H\Psi$

4 The Michelson-Morley experiment was designed to measure
(i) The relativistic mass of electron
(ii) The relativistic energy of electron
(iii) The velocity of the earth relative to the ether
(iv) The acceleration of gravity on the Earth's surface

5 The general relativity states that the inertial mass is equal to the _____ mass.
(i) gravitational (ii) momentum
(iii) relative (iv) Absolute

SECTION - B (15 Marks)
Answer **ALL** Questions
ALL Questions Carry **EQUAL** Marks (5 x 3 = 15)

6 a State the significance of Constants h and c.
OR
b Describe the wave particle duality in nature.

7 a Explain Uncertainty Principle.
OR
b Write the applications of Electron Microscope.

8 a Derive Schrodinger wave equation.
OR
b Describe Tunneling effect.

9 a With neat diagram Explain Michelson Morley experiment.
OR
b Derive Einstein's law of addition of velocities.

10 a Write the basic concepts of general theory of relativity.
OR
b Explain bending of light.

Cont...

SECTION -C (30 Marks)

Answer **ALL** questions
ALL questions carry **EQUAL** Marks (5 x 6 = 30)

11 a Derive the Einstein's Photoelectric Equation

OR

b Discuss Davisson and Germer's experiment on diffraction of Electrons.

12 a With the help of an Experiment Illustrate Heisenberg's uncertainty Principle

OR

b Distinguish Electron Microscope over Ordinary optical microscope.

13 a Derive Time dependent and time Independent wave equations.

OR

b Explain Linear Harmonic oscillator.

14 a Compare Galilean transformation and Newtonian relativity.

OR

b Explain variation of Mass with velocity.

15 a What is the equivalence of gravitational and inertial mass?

OR

b Describe about the precession of Mercury's perihelion?

Z-Z-Z END