

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)
BSc DEGREE EXAMINATION DECEMBER 2017
(Fifth Semester)

Branch- PHYSICS

QUANTUM MECHANICS & RELATIVITY

Time : Three Hours

Maximum : 75 Marks

SECTION-A (20 Marks)

Answer ALL questions

ALL questions carry EQUAL marks (10 x 2 = 20)

- 1 Write any two properties of photons.
- 2 What are matter waves?
- 3 State Heisenberg's uncertainty principle.
- 4 Write the advantages of electron microscope over optical microscope.
- 5 What is tunneling effect?
- 6 For a free particle moving within a one dimensional potential box, the ground state energy cannot be zero. Why?
- 7 What are the postulates of special theory of relativity?
- 8 What is meant by time dilation?
- 9 What is the principle behind bending of light?
- 10 Define Geodesic effect.

SECTION - B (25 Marks)

Answer ALL Questions

ALL Questions Carry EQUAL Marks (5 x 5 = 25)

- 11 a Derive Einstein's photoelectric equation.
OR
b Explain the quantum properties of micro particles.
- 12 a A microscope, using photons, is employed to locate an electron in an atom to within a distance of 2.0 \AA . What is the uncertainty in the momentum of the electron located in this way?
OR
b Explain the working of electron microscope with neat diagram.
- 13 a Derive Schrodinger's time dependent wave equation.
OR
b Discuss the application of Schrodinger's equation for a particle in a box.
- 14 a Show that the addition of any velocity to the velocity of light merely reproduces the velocity of light.
OR
b Show that for values of $V \ll C$, Lorentz transformation reduces to the Galilean transformation.
- 15 a Discuss the basic concepts of general theory of relativity.
OR
b Explain the equality of gravitational and inertial masses.

SECTION - C (30 Marks)

Answer any THREE Questions

ALL Questions Carry EQUAL Marks (3 x 10 = 30)

- 16 Describe Davisson and Germer's experiments for the study of electron diffraction. What are the results of the experiment?
- 17 Illustrate Heisenberg's uncertainty principle with Bohr's idealized thought experiment.
- 18 Establish Schrodinger's equation for a linear harmonic oscillator.
- 19 With relevant diagram explain Michelson - Morley experiment.