

**PSG COLLEGE OF ARTS & SCIENCE  
(AUTONOMOUS)**

**BSc DEGREE EXAMINATION MAY 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 Define one electron volt.
- 2 Distinguish between wave and particle.
- 3 State the limitations of optical microscope.
- 4 The life time of an excited state of an atom is about  $10^{-8}$  second. Calculate the minimum uncertainty in the determination of the energy of the excited state.
- 5 What is Schrodinger's wave equation?
- 6 A particle is moving in a one dimensional box of infinite height of width L. Obtain the wave function of the particle at the centre of the box when it is in its state of least energy .
- 7 What are inertial frames of references?
- 8 Give any two examples for the equivalence of mass and energy.
- 9 State the postulates of general theory of relativity.
- 10 Mention the concepts predicted by Einstein on the basis of general theory of relativity.

**SECTION - B (25 Marks)**

Answer **ALL** Questions

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

- 11 a Discuss the Davisson and Germer's experiment and explain its results.  
OR  
b Obtain the expression for wavelength of de Broglie' mater waves and also derive the expression for the wavelength of electron wave.
- 12 a Illustrate the Heisenberg's uncertainty principle with Bohr's idealized thought experiment.  
OR  
b Establish the non-existence of electrons inside the nucleus.
- 13 a Derive the Schrodinger time independent wave equation.  
OR  
b Obtain the expression of energy eigen value for a particle in a box.
- 14 a Deduce Lorentz transformation equations.  
OR  
b Derive the expression for mass - energy equivalence.
- 15 a Establish the equality of gravitational and inertial masses.  
OR  
b Explain about bending of light on the basis of general theory of light.

SECTION - C (30 Marks)

Answer any THREE Questions

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

- 16 i) What is photoelectric effect? Derive Einstein's photoelectric equation,  
ii) Discuss the role of the constant 'c' and 'h' in physics.
- 17 With neat diagram, explain the principle,, construction, working and applications of electron microscope.
- 18 Formulate the Schrodinger's wave equation for a liner harmonic oscillator and solve it to obtain its eigen value and eigen functions.
- 19 Describe the Michelson - Morley experiment.
- 20 Write a note on (i) Curvature of space - time geodesis  
(ii) Gravitational red shift  
(iii) Precession of Perihelion of Mercury.

Z-Z-Z •

END