E 3212 (Pages : 2) Reg. No...1100142.....

Name....Shifa.....

# B.Sc. DEGREE (C.B.C.S.S.) EXAMINATION, OCTOBER 2016

## Fifth Semester

Core Course—CLASSICAL AND QUANTUM MECHANICS

Common for Model I and Model II B.Sc. Physics

(B.Sc. Physics E.E.M. and B.Sc. Physics Instrumentation)

[2013 Admission onwards]

Time : Three Hours Maximum : 60 Marks

## Part A

*Answer* **all** *questions.*
*Each question carries* 1 *mark.*

1. In holonomic constraints, the conditions of constraints are expressible as equations connecting the ———— and time.
2. Hamilton's principle is a ———— formulation of the laws of motion in configuration space.
3. The wave nature and ———— nature complement each other.
4. The change in ———— of photon during scattering is called Compton effect.
5. A probability must be a ———— real quantity.
6. The functions that satisfy Schrodinger equations for the discrete energy ———— are called eigen functions.
7. The spacing of the energy levels is ———— for a harmonic oscillator.
8. The components of the angular momentum operator do not ———— among themselves.

(8 × 1 = 8)

## Part B

*Answer any* **six** *questions.*
*Each question carries* 2 *marks.*

9. What are generalized co-ordinates ?
10. State the D Alembert's principle.
11. State the principle of least action.
12. What is Compton Effect ?
13. What are operators ?
14. What is meant by expectation value ?
15. What is the significance of eigen values ?

Turn over

16. What is phase velocity ?
17. What is degeneracy ? Explain.
18. Why there exists zero point energy ?

(6 × 2 = 12)

## Part C

*Answer any* **four** *questions.*
*Each question carries* 4 *marks.*

19. Obtain Lagrange's equation from Hamilton's principle.
20. Find the differential equations of motion of a spherical pendulum using Lagrangain method.
21. Calculate the de Broglie wave length of an electron with kinetic energy 1eV.
22. A hydrogen atom is $5.3 \times 10^{-11}$m in radius. Use the uncertainty principle to estimate the minimum energy an electron can have in this atom.
23. Find the expectation value $< x >$ of the position of a particle trapped in a box L wide.
24. Bring out the angular momentum operators and their basic commutation relations.

(4 × 4 = 16)

## Part D

*Answer any* **two** *questions.*
*Each question carries* 12 *marks.*

25. What are constraints ? Derive Langragain equation for a non holonomic system.
26. Discuss the Davisson-Germer experiment and observe the conclusions.
27. Obtain the energy eigen values of a rigid rotator.
28. Obtain the energy spectrum of one dimensional harmonic oscillator.

(2 × 12 = 24)