Shree H.N.Shukla College of Science Rajkot

PHYSICS

T.Y.B.Sc. (Sem. V) (CBCS)

Preliminary examination

PAPER- 501

[Time: 2.30 hours] **[Total Marks: 70]**

Date: 3/10/16

Instructions: All questions are compulsory.
The right side figure indicates total marks of the question.
Draw the figure wherever necessary.
Write answers of all the questions in main answer sheets.

SECTION-A

Q.1: Answer The Question in one line: **[20]**

1) The eigen values of self adjoint operator are …………. .

2) The expectation value <A> may be?

3) The three dimension dirac delta function is expressed by ………. .

4) The number of N^2 is called the ________ of the wave function Ψ.

5) In terms of langragian L, Hamilton’s principle state that L becomes .

6) The configuration space is __________.

7) What is fourier coefficient b_n ?

8) What is Fourier coefficient a_n ?

9) Rheonomus constraints are ………… .

10) For a system of N particle moving independtly of each other the number of degree of freedom is

11) For linear quantum mechanical operator A,B,C , [A, B+C] = __________.

12) If A is self adjoint operator then $(AB)^\dagger$ = ?

13) $[Z, P_Z] = ?$

14) What is the value of $\sum_{n=1}^{\infty} \frac{1}{n2}$?

15) The value of series $1 + \frac{1}{3} + \frac{1}{5} + \ldots +$ is equal to ………..

16) What Schrödinger equation for a free particle in three dimension ?

17) $[X, P_x^n] =$ ________.

18) A constraint which depend upon time is called __________.

19) $[L_y, L_x] =$ ________.

20) A phase space is a _________ dimension space.

SECTION – B

Q.2 (A): Short Questions: Write any three [2 Marks each] **[06]**

1. Write the fourier series.
2. Explain holonomic constraints.
3. Define Configuration Space.
4. Obtain D'alembert principle.
5. Discuss in short: free particle.
6. Obtain coefficient a_0 in flourier series.

Q.2 (B): Short questions: Write any three [3 Marks each] **[09]**

1. Give physical condition on Ψ.
2. What is constraint? Explain it.
3. Describe sine series.
4. Obtain newton's equation of motion from langrage equation.
5. Explain Normalization.
6. Explain cyclic or ignorable co- ordinates.

Q.2 (C): Write Detail Note on [Any two] : [5 Marks each] **[10]**

1. Give the application of fourier series as a square wave analysis .
2. Explain general expression for kinetic energy.
3. Derive the schrodinger equation of a free particle in one particle.
4. A periodic function f(x) with periode 2 π is defined as

   $F(x) = -x$ for $-\pi < x < 0$

   $F(x) = x$ for $0 \le x < \pi$

5. Show that $[L_X, L_Y] = i\hbar L_X$

SECTION – C

Q.3 (A): Short Questions: Write any three [2 Marks each] [06]

1. Explain dirac delta function.
2. Write an equation for self adjoint operator.
3. Explain laws of conservation of momentum.
4. Obtain coefficient a_n in fourier series.
5. What is wave packet.
6. What is stationary state.

(B): Short questions: Write any three [3 Marks each] [09]

1. Discuss atwood machine.
2. Discuss phase space.
3. Write Ehrenfest's theorem.
4. Derive an equation for motion of simple pendulum using langrage's equation.
5. Describe cosine series.
6. Give the interpretation of probability.

(C) Write Detail Note on [Any two] : [5 Marks each] [10]

1. Derive Hamiltonian principle from newton's equation.
2. Explain box normalization.
3. Explain langrage's undetermined multipliers.
4. Discuss a particle in square well potential.
5. Fourier series application as a full wave rectifier.

ALL THE BEST