RN-003-1015025   Seat No. _____

B. Sc. (Sem. V) (CBCS) (W.I.F. 2016) Examination

February - 2019

Physics : Paper - 501

Faculty Code : 003

Subject Code : 1015025

Time : $2\frac{1}{2}$ Hours]   [Total Marks : **70**

Instructions : (1)   Attempt all questions.

(2)   Figures on right side indicate marks.

1   (A)   Answer the following questions :   4

(1)   The value of coefficient a_n is _____ for Fourier series in interval $(-l, l)$.

(2)   For even function, the value of b_n is _____ in Fourier series for interval $(-\pi, \pi)$.

(3)   Sine series also known as _____ series.

(4)   For odd function $f(-x) =$ _____

(B)   Give any **one** answer in brief from following questions :   2

(1)   Obtain the complex form of Fourier series.

(2)   Explain the advantages of Fourier series.

(C)   Give any **one** answer in detail from following questions :   3

(1)   Explain the properties of Dirac Delta function.

(2)   Obtain the Fourier cosine series.

(D)   Write a note on any **one** in detail from following questions :   5

(1)   Obtain the Fourier series for full wave rectifier function.

(2)   Explain in detail Fourier integral.

2 (A) Answer the following questions :   **4**
    (1) When a particles moves three dimension specs, it has _____ degree of freedom.
    (2) What is the generalized coordinate of a simple pendulum?
    (3) Write the equation of generalized force.
    (4) Give the expression of Hamilton's principle.

  (B) Give any **one** answer in brief from following   **2**
    questions :
    (1) Explain configuration space.
    (2) Explain generalized displacement and generalized velocity.

  (C) Give any **one** answer in detail from following   **3**
    questions :
    (1) Obtain Newton's second law of motion from Hamilton's principle.
    (2) Explain Rayleigh's dissipation function.

  (D) Write a note on any **one** in detail from   **5**
    following questions :
    (1) What are called constraint motion? Explain the classification of constraints.
    (2) Obtain the Lagrange's equation of motion from D'Alembrt's principle for conservative system.

3 (A) Answer the following questions :   **4**
    (1) Write the equation of motion of compound pendulum.
    (2) Hamiltonian is function of _____ , _____ and _____.
    (3) Lagrangian $L = L$ (_____, _____, _____)
    (4) Define the phase space of n coordinate system.

  (B) Give any **one** answer in brief from following   **2**
    questions :
    (1) What is called cyclic coordinate? Explain generalized momentum from it.
    (2) Discuss physical signification of Hamiltonian.

(C) Give any **one** answer in detail from following 　　3
questions :
(1) Obtain the Hamilton's canonical equation of motion.
(2) Explain superiority of Lagrangian approach over Newtonian approach.

(D) Write a note on any **one** in detail from 　　5
following questions :
(1) Obtain the equation of simple pendulum from Lagrange's multiplier method.
(2) Explain conservation of linear momentum.

4 (A) Answer the following questions : 　　4
(1) The momentum operator in three dimension is given by _____
(2) $[x, P_x] =$ _____
(3) The ejected electron in compton effect is known as _____ electron.
(4) The term $\int \psi^* x \, \psi$ is known as _____ values of position.
(5) What is the orthogonality condition?

(B) Give any **one** answer in brief from following 　　2
questions :
(1) Drive the value of $\left[P_x, P_y \right]$
(2) Normalize the function $\psi = A \, e^{ikx}$ over the region $-a < x < a$.

(C) Give any **one** answer in detail from following 　　3
questions :
(1) Explain the experimental study of photoelectric effect.
(2) Discuss the uncertainty principle.

(D) Write a note on any **one** in detail from 　　5
following questions :
(1) Explain kinematics of Compton effect and obtain the equation of Compton shift.
(2) Derive the Schrodinger equation for free particle in one dimension.

5 (A) Answer the following questions : **4**

(1) $L_z = -i\hbar$ (_____)

(2) What is the ground state energy of harmonic oscillator?

(3) If A is unit operator then, $\alpha|A\rangle =$ _____

(4) What is the Hamiltonian for a linear harmonic oscillator?

(B) Give any **one** answer in brief from following **2**
questions :

(1) Explain linear operator.

(2) Obtain the wave function of harmonic oscillator from bra and ket notation.

(C) Give any **one** answer in detail from following **3**
questions :

(1) Explain the coherent state.

(2) Explain ket and bra vector.

(D) Write a note on any **one** in detail from **5**
following questions :

(1) Obtain the simplified form for the oscillator from Schrodinger equation.

(2) Obtain the Hermite's differential equation.

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