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HDZ-003-0493006 Seat No. _____

B. Sc. / M. Sc. (Applied Physics)
(Sem. III) (CBCS) Examination
November / December – 2017
Paper - XII : Modern Physics - II
(New Course)

Faculty Code : 003
Subject Code : 0493006

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

Instructions : (1) All questions are compulsory.
(2) Numbers in the right margin indicate marks.

1 Attempt any seven short questions : (two marks each) **14**

(1) Write down the basic Postulates of Wave mechanics.

(2) What is Heisenberg's Uncertainty Principle?

(3) Differentiate between Classical and Quantum Statistics.

(4) Define Phase Space and Phase Point.

(5) What are Microscopic and Macroscopic systems?

(6) Write the Principle of LASER.

(7) What are radiative and non-radiative transitions?

(8) Describe in brief Stimulated Absorption and Stimulated Emission.

(9) Write a short note on π - Meson.

(10) What are common decay modes of hyperons?

2 (a) Write answers of any **two** : (five marks each) **10**

(1) Derive the Time dependent Schrodinger's wave equation in 3-D.

(2) Derive equations for the Phase Velocity and Group Velocity.

(3) Derive an expression for the energy of a particle in an infinite square well potential.

(4) Derive the Time independent Schrodinger's wave equation in 3-D.

(b) Write answer of any **one** : (four marks each)   **4**

    (1) Describe various properties of wave function.

    (2) What is de-Broglie wave? Derive expression for its wavelength.

3 (a) Write answers of any **two** : (five marks each)   **10**

    (1) Derive Maxwell's Boltzmann Distribution law of velocities

    (2) Derive an expression for probability distribution of particles using Fermi Dirac statistics.

    (3) Write a detailed note on three statistical distribution functions with necessary diagrams.

    (4) Derive an expression for probability distribution for a Bose-Einstein system of particles.

(b) Write answer of any **one** : (four marks each)   **4**

    (1) State and explain the Law of equipartition of Energy.

    (2) Compare Maxwell -Boltzmann (MB), Bose-Einstein (BE) and Fermi-Dirac (FD) Statistics.

4 (a) Write answers of any **two** : (five marks each)   **10**

    (1) Describe the construction and working of RUBY LASER.

    (2) Write down various characteristics and applications of LASER.

    (3) Describe the construction and working of He-Ne LASER.

    (4) What is meant by Population Inversion? Describe different pumping method used in LASER.

(b) Write answer of any **one** : (four marks each)   **4**

     (1) Derive relations between Einstein's coefficients.

     (2) Explain Semiconductor LASER with necessary diagram.

5 (a) Write answers of any **two** : (five marks each)   **10**

     (1) What are four fundamental interactions in nature?

     (2) Describe the concept of Lepton and Baryon Conservation.

     (3) Write a detailed note on Strangeness.

     (4) Describe in details various mediators of an interaction.

(b) Write answer of any **one** : (four marks each)   **4**

     (1) Write a note on Isotopic Spin.

     (2) Describe the classification of Elementary Particles.

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