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UTTARAKHAND OPEN UNIVERSITY, HALDWANI (NAINITAL)  
उत्तराखण्ड मुक्त विश्वविद्यालय, हल्द्वानी ( नैनीताल)

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M.Sc. Physics (MSCPHY13)

First Year Assignment

Last Date of Submission: 15 May 2016

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Course Title: Statistical Mechanics and  
Quantum mechanics

Course Code: PHY-502

Year: 2015-16

Maximum Marks: 40

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### Section A

Section A contains 08 short answer type questions of 5 marks each. Students are required to answer 4 questions only. Answers of short answer type questions should be 250 words approximately.

- 1- Distinguish three types of ensemble in detail.
- 2- Discuss the application of micro canonical ensemble to a perfect gas.
- 3- Define wave function. Give its interpretation and explain the conditions on wave function.
- 4- Explain Dirac's bra-ket notation to explain state of a system in vector space.
- 5- Find the solution of wave equation for a particle moving in one dimensional potential step.
- 6- What is spin angular momentum and spin operator? Derive Pauli spin matrices.
- 7- What is Stark Effect in hydrogen atom?
- 8- Explain Fermi Golden rule.

## Section B

Section B contains 04 long answers type question of 10 marks each and students are required to answers 02 questions only.

1. Explain a grand canonical ensemble and obtain the thermodynamic functions in terms of partition function
2. Deduce Schrödinger time independent and time dependent equation. Give the physical significance of wave function.
3. What are angular momentum operators? Express the operators of angular momentum components  $L_x$ ,  $L_y$  and  $L_z$  in spherical polar coordinate.
4. Explain the principle of time independent perturbation theory.