Quantum Computing – Notes Ver. 1.3

Prepared By: Vijayananda Mohire

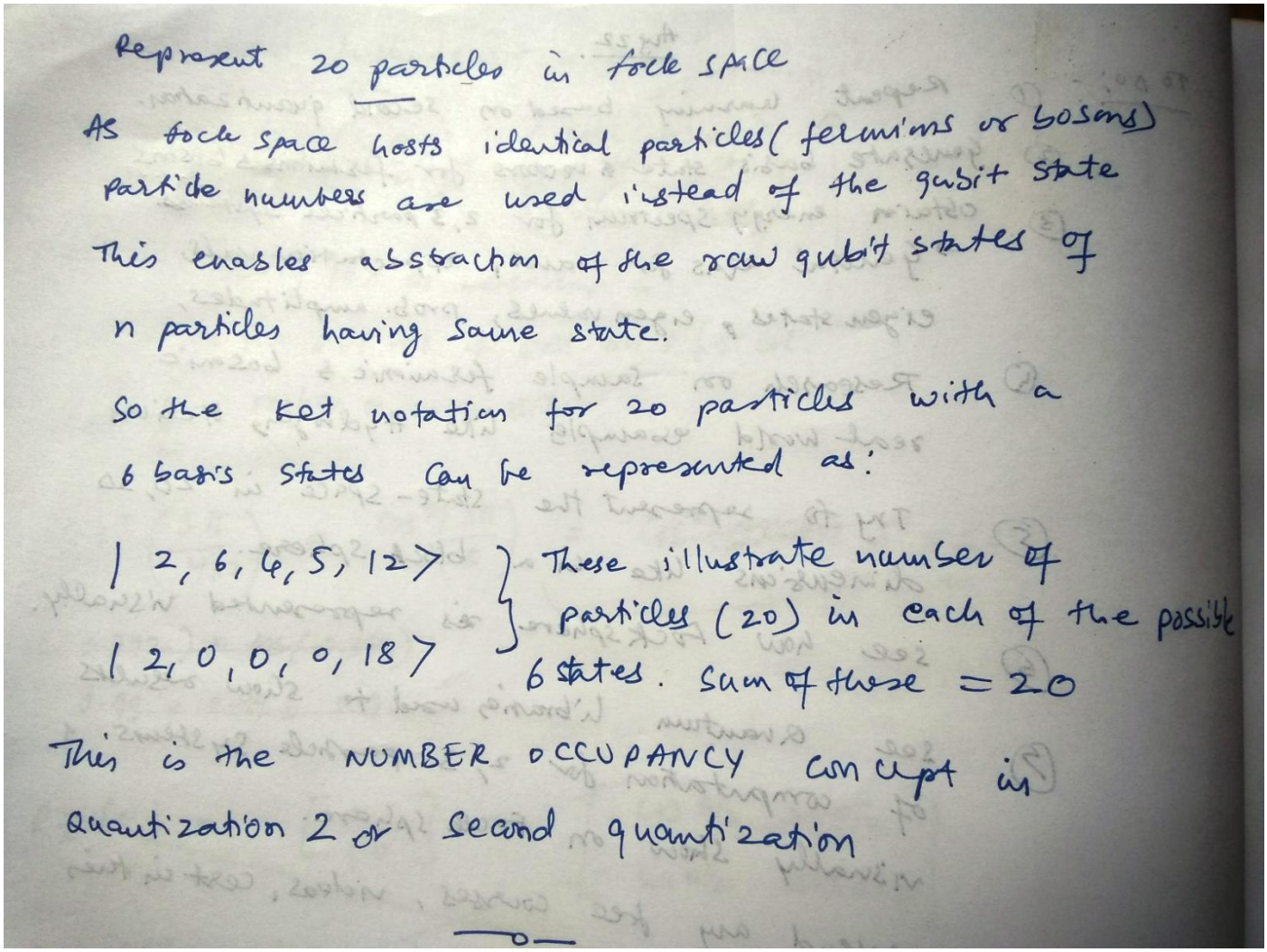
Sources: Various open courses, MOOC trainings and self study; no intention for any copyright infringements
Previous questions at: https://www.slideshare.net/Vijaymohire/quantum-computing-notes-ver-12

Question 30

Describe how you would represent a large set of particles in a Fock space rather than the Hilbert space

Answer 30

Fock space is a newer way (Second Quantization to represent multi-particles in an easier way unlike in the Hilbert space. Below is the broad way in simple terms



Question 31

Describe in simple words how Fock space uses Hilbert space

Answer 31

Fock space offers newer way of abstracting the state-space representations as previously done in the First Quantization. This helps is easier and shorter way in showing the quantum states.

Hilbert space H & Fock space F

H space is good for state-space representation of single particles in a Blochsphere.

The F space is F(H) is another Hilbert space and used to represent state of an N number of identical particles.

The state of the pair of particles belong to the tensor product of the state-spaces of the particles separately.

The particles are identical & subject to symmetry.

Bosons have symmetrical states under exchange

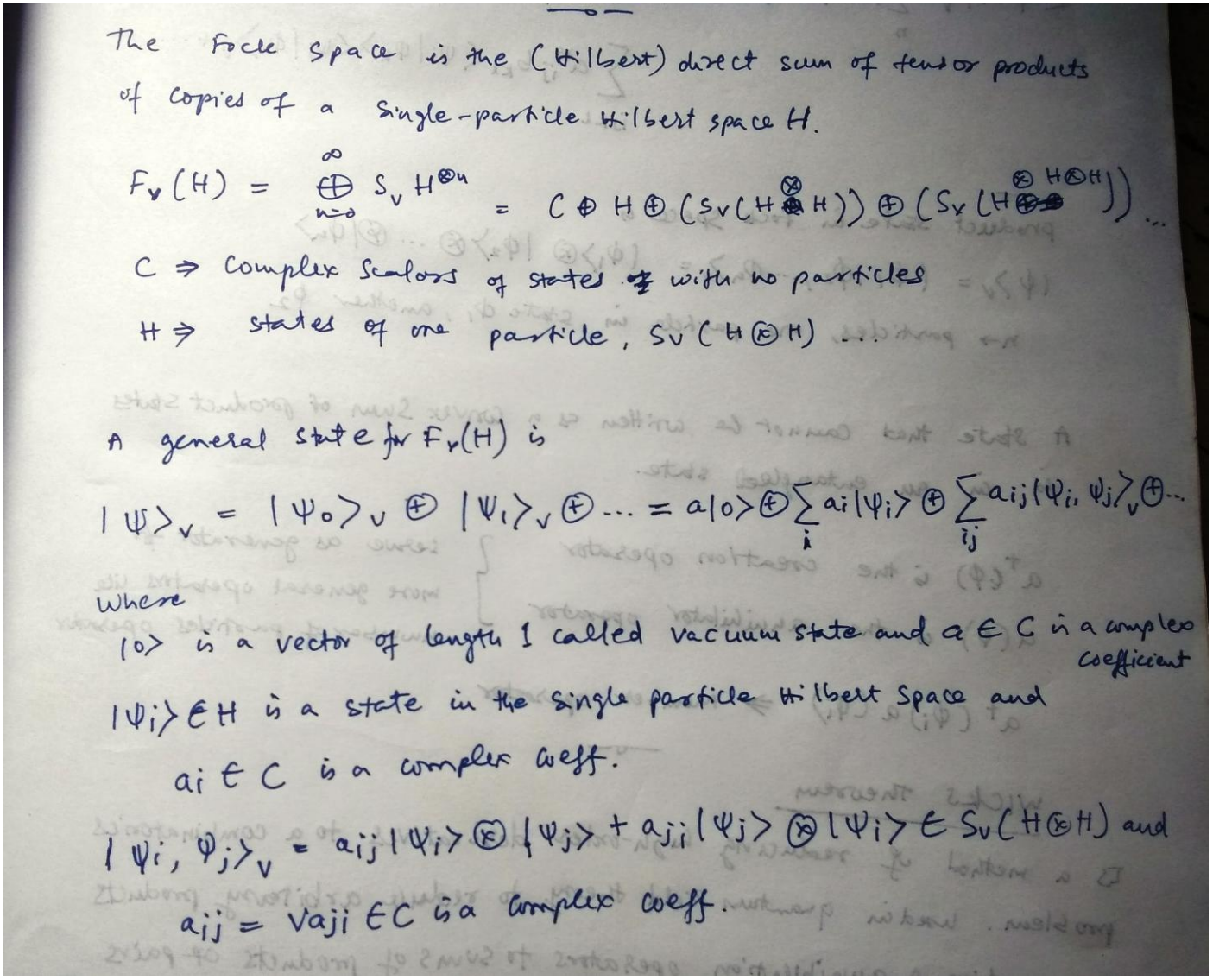
Fermions state change sign under exchange

Fock space takes the sequence of n-fold tensor products of H, imposes symmetry and adds them.

Question 32

Describe the Fock space mathematically

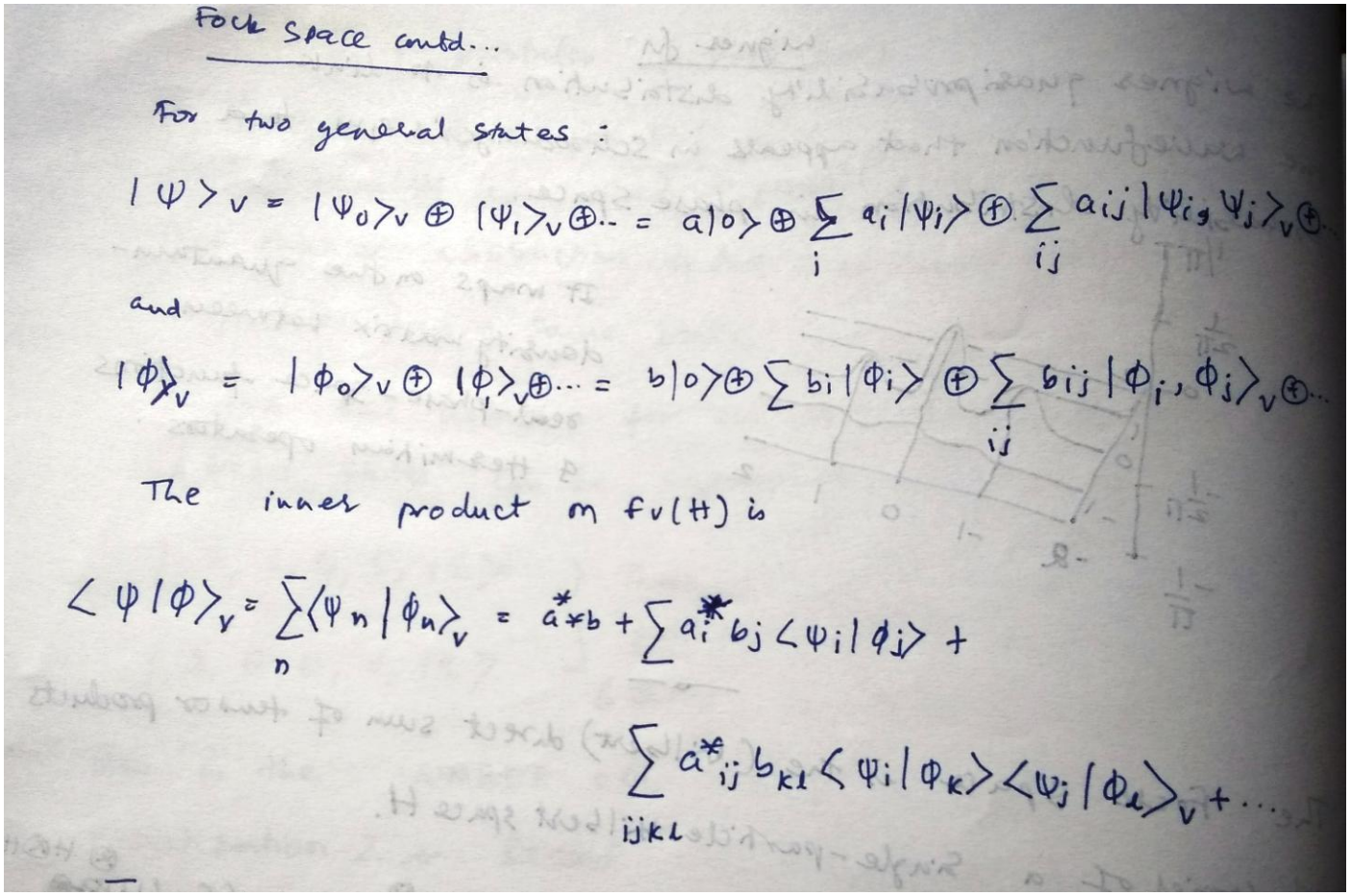
Answer 32



Question 33

Describe in general how two states are represented in Fock space and their inner product

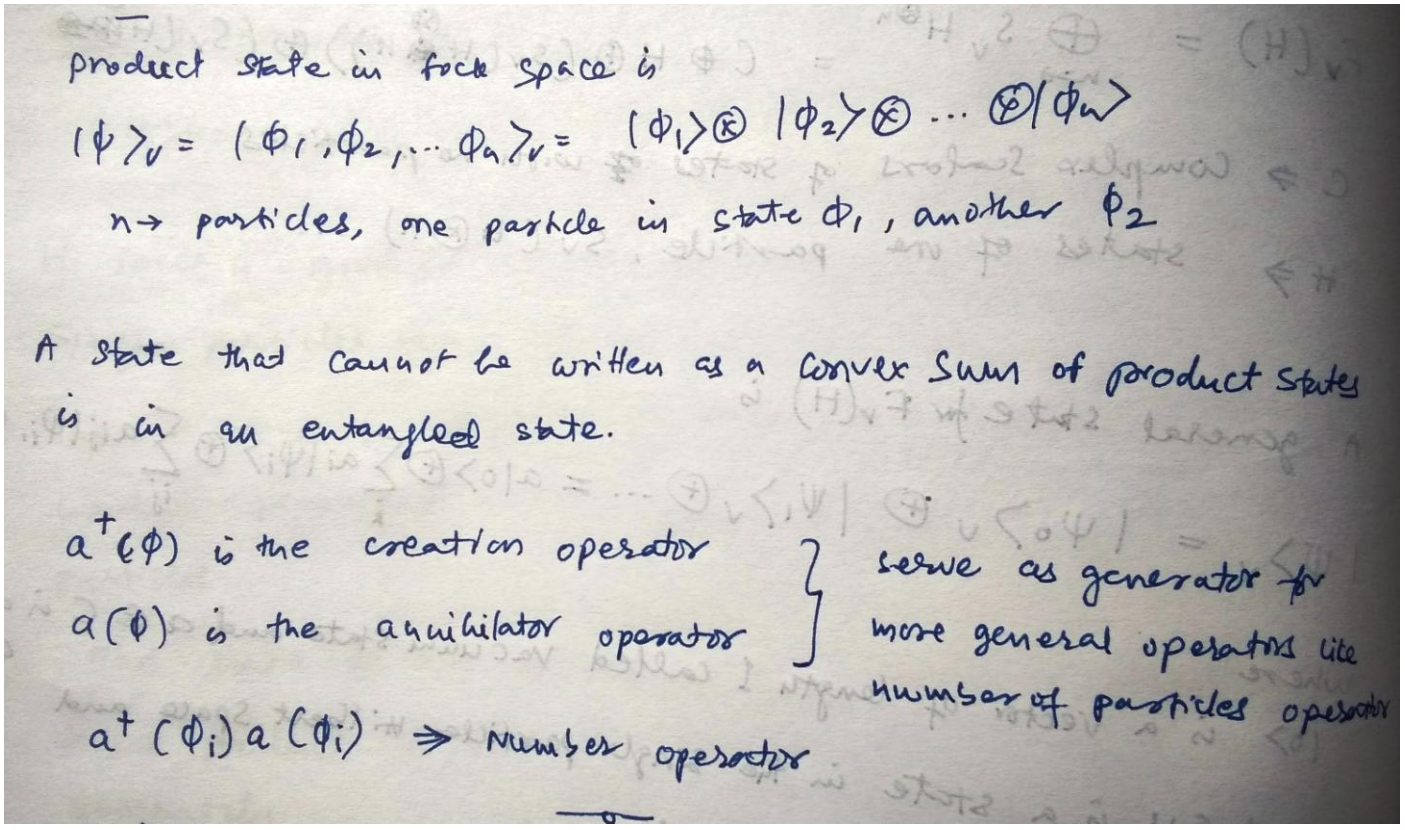
Answer 33



Question 34

Describe the general format of the product state in Fock space and the key operators used

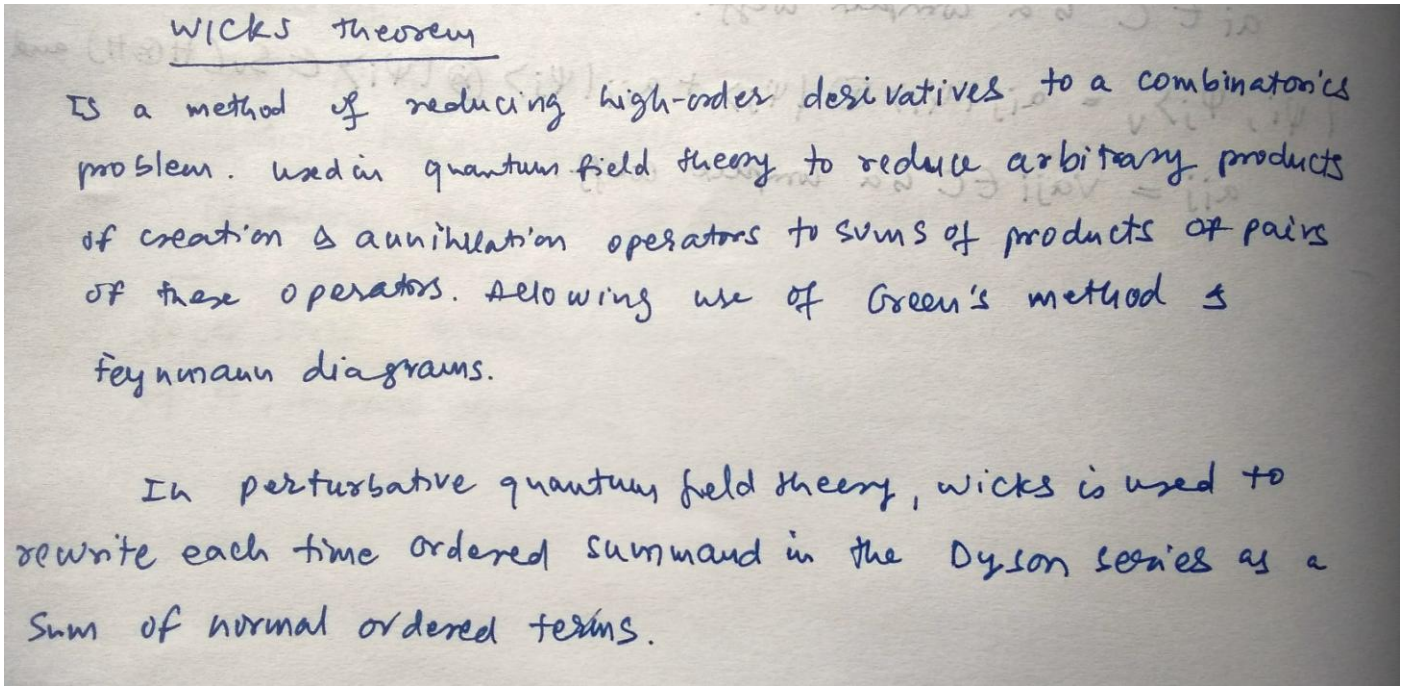
Answer 34



Question 35

Define in simple words what **Wicks method** is and where it is used

Answer 35



References:

1. MIT OpenCourseWare , https://ocw.mit.edu/
2. IBM Quantum Lab, https://quantum-computing.ibm.com/lab
3. Azure Quantum, https://azure.microsoft.com/en-in/services/quantum/
4. QuTech Academy, https://www.qutube.nl/
5. Wikipedia and the web