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COURSE CODE(CREDITS): 3   MAX. MARKS: 25

COURSE NAME: ADVANCED SOLID STATE PHYSICS (24P1WPH132)

COURSE INSTRUCTORS: Dr. Santu Baidya   MAX. TIME: 1 Hour 30 Minutes

Note: All questions are compulsory. Marks are indicated against each question in square brackets.

Q1. Write down the Hartree Fock approximation. Write down the Hartree Fock Slater determinant for a Li atom.   [2+3]
[CO-1]

Q2. Show that Hartree Fock Slater determinant follows the Pauli exclusion principle and asymmetric property.   [5] [CO-2]

Q3. Derive the Hartree-Fock energy E_{HF} and explain the exchange and correlation terms.

                             [2.5+2.5]

[CO-2]

Q4. Write down the single electron HF differential equations. What is a Fock operator?

                             [4+1]

[CO-1]

Q5. What is the definition of correlation energy? How many types of correlation are there inside a material and explain them?
[2+3] [CO-3]