



# THE AMERICAN COLLEGE, MADURAI

(An Autonomous Institution Affiliated to Madurai Kamaraj University)  
Re-accredited (2<sup>nd</sup> Cycle) by NAAC with Grade "A", CGPA – 3.46 on a 4-point scale

## Backlog Arrear Examination, March 2021

Course Code: PHY 3455/3575

Time: 3 Hrs

Course Title: Solid state Physics

Max. Mark: 75

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Answer any five of the following questions

5X15=75

1. Formulate the reciprocal lattice to SC, BCC and FCC lattices.
2. Explain the theory of diffraction of wave by crystals and obtain the expression for the amplitude of the scattered wave.
3. Derive the expression for Madelung energy and show that the Madelung constant for the one-dimensional chain is  $\alpha = 2 \ln 2$ .
4. Discuss the theory of Free electron Fermi gas in 3D, hence derive the Fermi energy and density of states.
5. Obtain the expression for intrinsic carrier concentration of semiconductor.
6. Discuss in detail the BCS theory of superconductors.
7. Derive London's equations. Hence deduce the expression for London penetration depth.

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