EX/PG/EE/T/114A/14/2017

MASTER OF ELECTRICAL ENGG. 1ST SEMESTER EXAM.-2017

MATERIALS TECHNOLOGY

Time: 3 hours **Full marks: 100**

Answer any **five** questions

1. Derive the space-dependent and the time-dependent parts of the wave function ψ, the intensity of which can be used to define the probability of finding the electron at a given point in space and time. 20

2. Discuss in details the one dimensional atomic model and draw the energy levels of the electrons. 20

3. (a) State Pauli's exclusion principle and discuss the electron states in multi-electron atoms. 10
   (b) Explain the notations for the quantum numbers and their values. 10

4. (a) Discuss close packed crystal structures of identical spheres. 8
   (b) Explain the Miller indices with proper graphical examples. 12

5. (a) Discuss analytically, potential energy and force as a function of inter-atomic spacing. 14
   (b) Give the mechanical model of an elastic crystal lattice. 6

6. (a) Discuss a.c. permittivity 6
   (b) Derive Clausius Equation for dielectric polarization and discuss the different components of polarizability. 14

7. (a) Derive orbital and spin magnetic moments of an atom. 10
   (b) Discuss temperature dependence of magnetism 10

8. Write short notes on any two: 10+10

   (a) Alignment of atomic magnetic moments ; (b) Ferroelectricity ; (c) Bonds in solids