Registration No : | | | | | | | | | | |

Total Number of Pages : 01 **M.Sc.I**

FPYC803

8th Semester Regular Examination 2018-19
BASIC CONDENSED MATTER PHYSICS
BRANCH : M.Sc.I(AP)
Time : 3 Hours
Max Marks : 70
Q.CODE : F284

Answer Question No.1 which is compulsory and any FIVE from the rest.
The figures in the right hand margin indicate marks.

Q1 **Answer the following questions :** **(2 x 10)**

a) What do you mean by Wigner-Seitz Primitive Cell? How is it constructed?
b) Find the Miller indices of a plane having intercepts of 8a, 4b and 2c on the a-,b-, and c-axes respectively.
c) What is liquid crystal?
d) What is a phonon?
e) What is lattice heat capacity?
f) What is the thermal conductivity of metal?
g) State Bloch theorem.
h) What is the origin of band gap?
i) What is Type-II superconductor?
j) What do you mean by flux quantization?

Q2 **a)** What are symmetry operations? Describe the principal symmetry operations applicable to a three dimensional lattice. **(5)**
b) Discuss about the Zinc-Blende structure. **(5)**

Q3 **a)** Obtain the dispersion relation for a one-dimensional monoatomic lattice. **(5)**
b) Discuss scattering of neutron and photons by phonons. **(5)**

Q4 **a)** Derive the density of state for free electron gas in one dimension. **(5)**
b) The atomic radius of sodium is 1.86 Å. Calculate the Fermi energy of sodium at absolute zero. **(5)**

Q5 **a)** Explain London equations and thereby London penetration depth. **(6)**
b) Explain DC Josephson effect. **(4)**

Q6 Starting from assumptions explain Debye's theory of specific heat of crystalline solid. **(10)**

Q7 Using Kronig-Penny model, show that the energy spectrum of an electron consists of a number of allowed energy bands separated by forbidden regions. **(10)**

Q8 **Write short answer on any TWO :** **(5 x 2)**

a) Carbon nanotubes
b) Effect of temperature on Fermi-Dirac distribution
c) BCS theory