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PG CBCS
M.Sc. Semester-II Examination, 2021
PHYSICS
PAPER: PHS 202

Full Marks: 40**Time: 2 Hour****Write the answer for each unit in separate sheet**

The figures in the right-hand margin indicate full marks.
 Candidates are required to give their answers in their own words as far as practicable

202.1: Solid State II**Marks: 20****Answer any TWO questions of the following:****2x10=20**

1. Derive London equations. Explain their significance. 6
 What do you mean by magnetic levitation? 2
 Explain the terms: i. Persistent current, ii. Critical current. 2
2. What is a Josephson junction? 2
 Explain ac and dc Josephson effect. 3+3
 State some application of superconductors. 2
3. What do you mean by Meissner effect? 2
 Give a brief description about the order of superconducting transition. 5
 What are the sources of polarization in a dielectric? Explain. 3
4. What do you mean by static dielectric constant and polarizability? 2
 Derive Debye equations for dielectrics. 4
 Draw and explain the dependence of total polarization for a dipolar substance on the frequency of the applied electric field. 4

202.2: SEMICONDUCTOR PHYSICS**Marks: 20****Answer any TWO questions of the following:****2x10=20**

1. Find the electric neutrality condition of a semiconductor which is doped with both acceptor and donor ions. Calculate the energy difference between the Fermi energy and conduction band in an intrinsic silicon sample at $m_e^*=1.1 m$ and $m_h^*=0.39 m$. 5+5

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2. Find the expression for depletion temperature of a semiconductor. Explain with necessary derivation how Fermi level changes with temperature. 5+5
3. Derive the expression for barrier potential. What do you mean by diffusion length of a semiconductor? Derive the expression for total current in a diode. 3+3+4
4. Under forward bias condition in a diode, derive the expression for diffusion capacitance. In a metal semiconductor junction, derive the expression for depletion width. 5+5
