B. Sc. (Physics) Semester – VI

Paper - 603 : Solid State Physics

Instructions: 1. Symbols have their usual meaning. 2. Figures on right hand side show marks of that question. 1. (a) Derive dispersion relation for the diatomic crystal and discuss different cases. OR 1. Write note on: (1) "Restrahlen band" and (2) "Phonon" 2. (a) Mention the drawbacks of classical theory and Einstein's theory of specific heat. Write the formula total energy of a solid according to Debye's theory and prove that for high temperatures it fellows the classical nature and for extreme low temperatures it follows the T ³ nature. (b) Discuss Debye's cut off approximation for theory of specific heat. OR 2. (a) Explain the terms: Einstein Temperature and Debye Temperature (b) Obtain an expression for the specific heat capacity of a solid on basis of Einstein's theory. Discuss its cases. 3. (a) Discuss the success of classical theory of free electron gas for metals. (b) Mention features of Sommerfeld quantum theory discuss how Sommerfeld quantum theory of free electron gas explains the occurrence of long mean free path. OR 3. (a) Explain the terms: "Fermi energy and Fermi function". (b) Discuss Kronig-Penney Model of Solids. 4. (a) What is "ISOTOP EFFECT", discuss the role of phonon in BCS theory to resolves the drawbacks of F-H Landon's of Superconductivity (b) Write note on: "Coherence Length" OR 4. (a) Explain striking features of superconductor. (b) Discuss a role of temperature and magnetic field on occurrence of superconductivity. (b) Calculate the temperature and magnetic field on occurrence of superconductivity. (b) Calculate the temperature required to bring mercury superconductor to its normal state under magnetic field 3 T. (T _c = 4.12 K, H ₀ = 3.3 × 10 ⁴ T) OR 5. (a) State and prove Bloch theorem.	·	Fime: 2 -30 Hours	A man of a series	[Total Marks70	
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(b) The Debye temperature of diamond is 1850 K. Calculate the specific heat per K mol for	5. (a)	State and prove	Bloch theorem.		[09
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