Visvesvaraya Technological University, Belagavi
MODEL QUESTION PAPER
5th Semester, B.E (CBCS) EC/TC
Course: 15EC554- Electrical Engineering Materials – Professional Elective

Time: 3 Hours   **Max. Marks: 80**

Note: (i) Answer Five full questions selecting any one full question from each Module.
(ii) Question on a topic of a Module may appear in either its 1st or 2nd question.

		Module-1	
1	(a)	Explain Kroning-Penney Model in detail.	7
	(b)	Explain the Formation of Solid Material.	7
	(c)	Find the first three energy levels of an electron in an infinite potential well. The width of the potential well is 5×10^{-2}. Comment on the result.	2
		OR	
2	(a)	Explain the classification of materials on the basis of band structure.	6
	(b)	Explain hole concept with an example.	10
		Module-2	
3	(a)	Explain the origin of magnetism with an example.	4
	(b)	Explain in detail the Langevin's Theory of Diamagnetism.	10
	(c)	A paramagnetic substance contains 6.5×10^{25} atoms per m^3 and the magnetic moment of each atom is one Bohr magneton. Find the susceptibility at 300K temperature.	2
		OR	
4	(a)	What are the characteristics of paramagnetic materials? Explain briefly.	6
	(b)	Explain Langevin's Theory of paramagnetism and its modification.	10
		Module-3	
5	(a)	Explain three electric vectors in detail.	7
	(b)	Explain Gauss's Law in dielectric.	7
	(c)	Calculate the polarisation of the He gas if placed in a field of 3×10^5 V/m. The poarisability of He gas is 0.18×10^{-40} Fm^2 and the concentration of the atoms is $2.6 \times 10^{25}/m^3$. Calculate the separation between positive and negative charges.	2

		OR	
6	(a)	Explain the polar dielectric in ac and dc fields.	8
	(b)	List the factors that influences the dielectric strength.	4
	(c)	What are the applications of Ferroelectric Materials in Devices.	4
		Module-4	
7	(a)	Explain the Ohm's Law in detail.	7
	(b)	Explain the effect of various parameters on Electrical Conductivity.	7
	(c)	The drift velocity is the average velocity exhibited by the electrons in presence of electric field. Calculate the drift velocity of such electrons in an aluminum wire of diameter 1.0mm carrying current of 6A. Assume that 4.5×10^{28} electrons are available for conduction.	2
		OR	
8	(a)	What are the characteristics of Superconductors?	8
	(b)	Explain the practical applications of Superconductors.	8
		Module-5	
9	(a)	Explain the difference in properties of Hard-Drawn and Annealed copper.	8
	(b)	Explain standard conductors?	4
	(c)	List the steps used for preparation of Tungsten Filaments.	4
		OR	
10	(a)	Explain the properties in detail for selecting the insulating material.	12
	(b)	Find the thermal conductivity of a metal containing 3×10^{22} electronics/cm^3 at 300K. The average collision time between electrons and the obstacles is 3×10^{-14}s. Take Lorentz number=2.44×10^{-8}ohmW/k2; the mass of electron is 9.1×10^{-3}1kg.	4

****