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B.E/B.Tech (Full Time) **DEGREE END SEMESTER EXAMINATIONS,**
BRANCH: EEE **SEMESTER – II** **APRIL / MAY 2013**
PH 9167 - Physics of Electrical and Electronic Materials **DURATIONS:** 3HRS
REGULATIONS: 2008 **ANSWER ALL QUESTIONS MAX. MARKS**:100

Part –A (10 x 2 = 20)

1. Find the Fermi function at T = 0K and T > 0 K using Fermi-Dirac distribution function? (2)
2. A Cu wire of 1 mm diameter carries a current of 5 mA. Calculate the average drift velocity of the free electrons. Cu is monovalent and crystallizes in FCC structure with a lattice parameter of 3.61 Å (2)
3. Draw the energy band diagram of Schottky junction whose metal work function lower than that of n-semiconductor (diagram alone). (2)
4. For Si semiconductor with bandgap (E_g = 1.12 eV), determine the position of the Fermi level at 300 K if $m^*_e = 0.12m_o$ and $m^*_h = 0.28\ m_o$ (2)
5. Write about intrinsic breakdown in dielectric materials (2)
6. Write the differences between piezoelectricity and pyroelectricity (2)
7. Write any two differences between the ferromagnetism and ferrimagnetism (2)
8. Consider a toroidal coil with a ferrite core. Suppose that the coil has 200 turns and is used in HF work with small signals. The mean diameter of the toroid is 2.5 cm and the core diameter is 0.5 cm. If there is a MnZn ferrite, what is the approximate inductance of the coil? (2)
9. Write short note on optical absorption (2)
10. Discuss about dichroism (2)

Part – B (5 x 16 = 80)

11. Determine the particle trapped in one dimensional potential well using Schrodinger wave equation and show the Eigen values and Eigen functions for ground state and first two excited states (16)

12.a) Derive an expression for the density of energy states of electrons and holes in the case of intrinsic semiconductors (16)

Or

b) i) Using time dependent Continuity equation, find out the rate of increase in excess hole concentration for a n-type semiconductor (8)

ii) Using steady state Continuity equation, find out the ratio of excess hole and electron concentration under steady state conditions for a n-type semiconductor (With relevant diagrams) (8)

13)a) Explain about the following polarization mechanisms

i) Electronic (8)

ii) Orientation (8)

Or

b) i) Describe about the origin of piezoelectricity with respect to the symmetry (8)
ii) As an example, explain about quartz oscillators and filters (8)

14. a) i) Explain about the origin of ferromagnetism and exchange interaction in ferromagnetic materials (10)
ii) Discuss about saturation magnetism and Curie temperature (6)

Or

b) Define Superconductivity‡? Explain the classifications of super conductors with necessary application†? (16)

15. a) Explain about the phenomenon of luminescence (especially occurrence of emission and excitation) in phosphor materials with respect to energy band diagram (16)

Or

b) Describe the electro-optics effects to determine the Pockel and Kerr coefficient for an uniaxial crystals with respect to applied field (16)