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Internal Assessment Test II – May 2019

Sub:	Engineering Physics Theory					Sub Code:	18PHY22	Branch:	EC, EE, ME
Date:	14-05-2019	Duration:	90 min's	Max Marks:	50	Sem / Sec:	II –I,J,K,L,M,N & O	OBE	

Answer any FIVE FULL Questions

Given: k = 1.38 x 10 $^{-23}$ J/K; NA = 6.02 x 10 ^{26} /K mole; m_e = 9.1 x 10^{-31}kg; e = 1.602 x 10^{-19}C ; ε_0 = 8.854 X 10^{-12} F/m

		MARKS	CO	RBT
1 (a)	Derive an expression for Fermi energy (E_F) at 0 K for metals.	[7]	CO5	L3
(b)	Calculate the probability that an energy level at 0.2 eV below the Fermi level being occupied at 300 K.	[3]	CO5	L3
2 (a)	Obtain the expression for Hall voltage and Hall coefficient.	[7]	CO5	L3
(b)	Discuss the dependence of Fermi factor (f(E)) on temperature.	[3]	CO5	L3
3 (a)	Discuss briefly internal field in dielectric materials and hence derive the Clausius - Mossotti equation.	[7]	CO5	L3
(b)	If the dielectric constant of a gas of atomic density $2.5x10^{25}/m^3$ is 1.00074, calculate the dipole moment induced in each atom when this gas is subjected to an electric field of 15 kV /m.	[3]	CO5	L3
4 (a)	Derive the relation between Fermi energy and energy gap for an intrinsic semiconductor.	[7]	CO5	L3
(b)	Calculate the resistivity of intrinsic germanium semiconductor at 27^0 C if its carrier concentration is 2.4 x10^{19} /m^3. Assume electron and hole mobilities are 0.38 and 0.18 $m^2 V^{-1} s^{-1}$ respectively.	[3]	CO5	L3

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Answer any FIVE FULL Questions

Given: k = 1.38 x 10 $^{-23}$ J/K; N_A = 6.02 x 10 ^{26} /K mole; m_e = 9.1 x 10^{-31}kg; e = 1.6 x 10^{-19}C ; ε_0 = 8.854 X 10^{-12} F/m

		MARKS	CO	RBT
1 (a)	Derive an expression for Fermi energy (E_F) at 0 K for metals.	[7]	CO5	L3
(b)	Calculate the probability that an energy level at 0.2 eV below the Fermi level being occupied at 300 K.	[3]	CO5	L3
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5 (a)	Derive an expression for the conductivity of an intrinsic semiconductor.	[6]	CO5	L3
(b)	Calculate the Hall voltage produced in a cube shaped semiconductor (side length = 5mm) carrying 3 mA current, when subjected appropriately to the magnetic flux density of 2 weber/m^2. Given that carrier concentration of the semiconductor is $1.7x10^{22}/m^3$.	[4]	CO5	L3
6 (a)	State Hooke's Law of elasticity? Explain briefly the various factors affecting elasticity.	[5]	CO1	L2
(b)	Show that shear strain is equal to the sum of elongation strain and compression strain.	[5]	CO1	L3
7 (a)	Define lateral strain coefficient (β), linear strain coefficient (α) and hence derive an expression for rigidity modulus (η) in terms of β and α.	[7]	CO1	L3
(b)	Discuss the limiting values of Poisson's ratio.	[3]	CO1	L2
8 (a)	Derive the relation between bulk modulus (K), Young's modulus (Y) and Poisson's ratio, hence obtain the relation between K, Y and η.	[7]	CO1	L3
(b)	Calculate the final volume of the spherical 10 cc (ml) water droplet, if it is compressed uniformly by the stress 20.5×10^{15} N/m^2. (Bulk modulus of the water is 0.2×10^{10} N/m^2).	[3]	CO1	L3

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