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NMAM INSTITUTE OF TECHNOLOGY, NITTE

Off-Campus Centre of Nitte (Deemed to be University)

I Sem B.Tech. (CBCS) Mid Semester Examinations - I, September 2022

PH1001-1 – ENGINEERING PHYSICS

Duration: 1 Hour | Max. Marks: 20

*Note: Answer any **One** full question from **each Unit.***

List of constants: Velocity of light, $c=3\times10^{8}ms^{-1}$, Planck's constant, $h=6.63\times10^{-34}$ Js, Electron mass, $m=9.11\times10^{-31}$kg, Electron charge, $e=1.6\times10^{-19}$C, Boltzmann constant, $k=1.38\times10^{-23}$J/K, Neutron mass=1.68×10^{-27} kg. Avogadro number, $N_A = 6.023\times10^{26}$/ kg mole.

			Marks	BT*	CO*	PO*
		Unit – I				
1.	a)	Explain the terms (i) Mater waves (ii) Probability density	3	L*1	1	1,2
	b)	Obtain the expression for one-dimensional time independent Schrodinger's wave equation.	4	L2	1	1,2
	c)	Calculate the de-Broglie wavelength of an electron moving with an energy of 1.5 keV.	3	L3	1	1,2
2.	a)	What are the characteristics of wave function?	3	L1	1	1,2
	b)	Solve the Schrodinger's wave equation for a particle in one dimensional potential well of infinite height.	4	L3	1	1,2
	c)	An electron is bound in a one-dimensional potential of width 1.5 Å, but of infinite wall height. Find its energy values in the ground state, and in the first excited states.	3	L3	1	1,2
		Unit – II				
3.	a)	With neat diagram, explain any three crystal systems.	3	L1	2	1,2
	b)	What is inter-planar spacing? Obtain an expression for inter-planar spacing in terms of lattice parameter and Miller indices for a cubic crystal.	4	L2	2	1,2
	c)	The lattice constant for a unit cell of aluminum is 4.031 Å. Calculate the interplanar spacing of (2 1 1) planes.	3	L3	2	1,2
4.	a)	Explain the origin of characteristic X rays.	3	L1	2	1,2
	b)	What is atomic packing factor? Determine the atomic packing factor for a face centered cubic (FCC) lattice by calculating number of atoms/unit cell and the relation between atomic radius and lattice constant.	4	L2	2	1,2
	c)	Draw a cubic unit cell and plot the following planes: (1 4 1) and $(3\,2\,\bar{1})$	3	L3	2	1,2

BT* Bloom's Taxonomy, L* Level; CO* Course Outcome; PO* Program Outcome

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MAM INSTITUTE OF TECHNOLOGY, NITTE

Off-Campus Centre of Nitte (Deemed to be University)

I Sem B.Tech. (CBCS) Mid Semester Examinations - II, November 2022

PH1001-1 – ENGINEERING PHYSICS

Duration: 1 Hour | Max. Marks: 20

*Note: Answer any **One** full question from **each Unit.***

List of constants: Velocity of light, $c = 3\times10^{8} ms^{-1}$, Planck's constant, $h=6.63\times10^{-34}$ Js, Electron mass, $m=9.11\times10^{-31}$kg, Electron charge, $e=1.6\times10^{-19}$C, Boltzmann constant, $k=1.38\times10^{-23}$J/K, Mass of neutron=1.68×10^{-27} Kg. Avogadro number, $N_A = 6.023 \times 10^{26}$/ kg mole.

			Marks	BT*	CO*	PO*
		Unit – I				
1.	a)	Distinguish between intrinsic and extrinsic semiconductor.	3	L*2	3	1,2
	b)	Obtain an expression for the conductivity of an extrinsic semiconductor	4	L3	3	1,2
	c)	Calculate the resistivity of intrinsic germanium if the intrinsic carrier density is 2.5×10^{19} m^{-3} assuming electron and hole mobilities of 0.38 $m^2v^{-1}s^{-1}$ and 0.18 $m^2v^{-1}s^{-1}$ respectively.	3	L3	3	1,2
2.	a)	Explain the effect of temperature on the Fermi level in a n-type semiconductor	3	L2	3	1,2
	b)	What is Fermi factor? Discuss the variation of Fermi factor for different energy levels with temperature	4	L2	3	1,2
	c)	Calculate the probability of an electron occupying an energy level 0.02 eV above the Fermi level at 200 K	3	L3	3	1,2
		Unit – II				
3.	a)	Distinguish between direct and indirect band-gap semiconductors	3	L2	4	1,2
	b)	What is Hall effect? Obtain an expression for the Hall coefficient and Hall voltage of an n-type semiconductor	4	L2	4	1,2
	c)	A semiconductor sample of thickness 1.2×10^{-4} m is placed in a magnetic field of 0.2T acting perpendicular to its thickness. Find the Hall voltage generated when a current of 100 mA passes through it. Assume the carrier concentration to be 10^{23} m^{-3}	3	L3	4	1,2
4.	a)	Explain Type-II superconductors with suitable diagrams.	3	L2	4	1,2
	b)	What are superconductors? Explain Critical magnetic field and Meissner effect in superconductors.	4	L2	4	1,2
	c)	The critical temperature and critical magnetic field for superconducting lead are 7.2 K and 800 gauss respectively. What will be the temperature up to which lead will be in superconducting state in a magnetic field of 400 gauss?	3	L3	4	1,2

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