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BMS College of Engineering, Bangalore-560019

(Autonomous Institute, Affiliated to VTU, Belgaum)

December 2016 Semester End Main Examinations

Course: **Engineering Physics** Duration: **3 hrs**
Course Code: **14PY11CPHY** Max Marks: **100**
Date: 14.12.2016

Instructions:

1.Answer any five full questions choosing one from each unit.

2. **Constants:** Planck's constant, $h = 6.63 \times 10^{-34}$ Js,
Mass of electron, $m_e = 9.11 \times 10^{-31}$ kg,
Charge of electron, $e = 1.602 \times 10^{-19}$ C,
Boltzmann constant, $k = 1.38 \times 10^{-23}$ J/K,
Avogadro's number, $N_A = 6.02 \times 10^{26}$ /k mol
Velocity of light, $c = 3 \times 10^{8}$ m/s
Permittivity of free space, $\varepsilon_0 = 8.854 \times 10^{-12}$ F/m

UNIT 1

1	a)	State de-Broglie hypothesis. Obtain the expression for de-Broglie wavelength using the concept of group velocity.	7
	b)	Show that electrons do not exist inside the nucleus based on Heisenberg uncertainty principle.	6
	c)	Explain the terms probability density and normalization in quantum mechanics.	4
	d)	The inherent uncertainty in the measurement of time spent by nuclei in the excited state is found to be 1.4×10^{-14}s. Estimate the uncertainty that results in its energy in the excited state.	3

OR

2	a)	Apply time independent Schrodinger wave equation for a particle in one dimensional potential well of infinite height and finite width to obtain eigen functions and eigen values.	10
	b)	Show that group velocity of a matter wave associated with moving material particle is equal to particle velocity.	6
	c)	A particle with mass 'm' is in an infinite potential well with walls at x = 0 and x = L/2. Write the wave functions for ground and second excited states.	4

UNIT 2

3	a)	Explain the construction and working of X-ray diffractometer. How it is used to determine the wave length of x-rays?	8
	b)	Explain the terms Frenkal defect, Schottky defect, edge dislocation and screw dislocation.	8

	c)	The results of an X-ray diffraction study showed two reflection maxima for glancing angles of $8^0 58'$ and $12^0 1'$ for a given crystal. Given that these are successive orders of reflection, find the order of reflection for which the glancing angle will be $18^0 12'$.	4

UNIT 3

4	a)	What is thermal conductivity? Obtain the expression for thermal conductivity of a conductor using classical free electron theory.	8
	b)	Define Fermi factor. Explain the variation of Fermi factor as a function of energy at different temperatures, with a graph.	8
	c)	Find the temperature at which there is 1 % probability that a state with energy 0.5eV above the Fermi-energy will be occupied by an electron.	4

UNIT 4

5	a)	Explain B-H graph in ferromagnetic materials using the concept of domains.	6
	b)	Obtain Clausius – Mossotti equation.	6
	c)	Mention any four features and applications of antiferromagnetic materials.	4
	d)	Find the dielectric constant of a material in which polarization of 2.214×10^{-8} Cm^{-2} is produced by the application of electric field of 500 Vm^{-1}.	4

UNIT 5

6	a)	Mention any four differences between ordinary light and laser light. Explain any two requisites of a laser system.	8
	b)	Elucidate the construction and working of He-Ne laser with an energy level diagram.	8
	c)	Calculate V-number and number of modes for a fiber of core radius 20μm and with refractive indices of 1.55 and 1.50 respectively for core and cladding. The wavelength of the propagating wave is 1400nm. Assume that the fiber is in air.	4

OR

7	a)	Explain with neat diagram types of optical fibers.	8
	b)	What is attenuation in optical fibers and mention the expression for attenuation? Also explain the causes of attenuation.	8
	c)	A He-Ne laser is emitting a beam with an average power of 4.5mW. Find the number of photons emitted per second by the laser. The wavelength of the emitted radiation is 6328 Å.	4

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