K. J. Somaiya Institute of Technology, Sion, Mumbai-22
(Autonomous College Affiliated to University of Mumbai)

Nov – Dec 2022 (Second Half - Winter Examination 2022)
Program: B.Tech. (Basic Sciences and Humanities)
Examination: FY Semester: I
Course Code: BSC102 and Course Name: Engineering Physics
Date of Exam: 22-02-2023 Duration: 02 Hours Max. Marks: 45

Instructions:
(1) All questions are compulsory.
(2) Draw neat diagrams wherever applicable.
(3) Assume suitable data, if necessary.

		Max. Marks	CO	BT level
Q 1	**Solve any 5 questions out of six.**	**15**		
i)	State de Broglie hypothesis of matter waves and deduce the expression for λ using Planck's relation and Einstein relation.	3	CO1	U
ii)	The speed of an electron is measured to within an uncertainty of 2×10^4 m/s. What is the minimum space required by the electron to be confined to an atom?	3	CO1	APP
iii)	Draw the following planes in a cubic unit cell –(111), $(1\bar{2}1)$, (120)	3	CO2	U
iv)	What is the effect of increasing temperature on Fermi level in intrinsic semiconductor, n-type semiconductor and p-type semiconductor?	3	CO3	U
v)	In a Newton's ring experiment, the diameter of the 10^{th} dark ring changes from 1.4 cm to 1.27 cm when a liquid is introduced between the lens and the plate. Calculate the refractive index of the liquid.	3	CO4	APP
vi)	Differentiate between Type I and Type II superconductors.	3	CO5	U
Q.2	**Solve any three questions out of four.**	**15**		
i)	Derive one dimensional Schrodinger's Time Independent wave equation.	5	CO1	U
ii)	An electron is trapped in a one dimensional box of length 0.1 nm. Calculate the energy required to excite the electron from its ground state to the 4^{th} excited state.	5	CO1	APP
iii)	Show that in an intrinsic semiconductor, the fermi level lies at the middle of the forbidden gap.	5	CO3	U

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iv)	Derive the relation between conductivity and mobility. Calculate the number of donor atoms which must be added to an intrinsic semiconductor to obtain the resistivity as 10^{-6} ohm-cm. Use mobility of electron = 1000 cm^2/V-sec.	5	CO3	APP
Q.3	**Solve any three questions out of four.**	**15**		
i)	Obtain Bragg's law of X-ray diffraction. Bragg's reflection of the first order was observed at 21.7^0 for parallel planes of a crystal under test. If the wavelength of X-rays used is 1.54 A^0, find the interplanar spacing for the planes in the crystal.	5	CO2	APP
ii)	What is anti-reflecting coating? What should be refractive index and minimum thickness of the coating?	5	CO4	U
iii)	An air wedge is formed by keeping a fine wire at one edge between two glass plates. When the film is illuminated normally with light of wavelength 550 nm, fringe-width of the fringes observed is 1 mm. Calculate the diameter of the wire if the length of the plate is 5cm.	5	CO4	APP
iv)	State Meissner Effect. Why superconductor is termed as a perfect diamagnetic material?	5	CO5	U

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