

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

Supplementary Exam. August 2023		
Program: B.Tech. (Basic Sciences)		
Examination: FY Semester: I Scheme: II		
Course Code: BSC102 and Course Name: Engineering Physics		
Date of Exam: 09-08-2023	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)	An electron confined in an infinite well of width 1nm. Calculate its ground state energy.	3	CO1	APP
iii)	Draw the following planes in a cubic unit cell $-(111), (100), (121)$	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)	Why excessively thin films appear black?	3	CO4	U
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 Time Dependent Schrodinger equation for matter waves.	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
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	5	CO3	APP

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	mobility of electron = $1000 \text{ cm}^2/\text{V-sec}$.			
Q.3	Solve any three questions out of four.	15		
i)	How can we determine crystal structure with observations obtained using Bragg's X-ray spectrometer?	5	CO2	APP
ii)	Obtain the expression for path difference between two reflected rays in thin transparent film.	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 and explain Meissner's effect with the help of diagram.	5	CO5	U
