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

Nov – Dec 2025 (Second Half - Winter Examination 2025)
Program: B.Tech. (Basic Sciences and Humanities) Scheme II & III
Examination: FY Semester: I
Course Code: BSC102 and Course Name: Engineering Physics
Date of Exam: 14/01/2026 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)	Draw the following inside the cubic unit cell. $(1\,1\,0), (1\,\bar{2}\,1)\ (1\,\bar{1}\,\bar{1})$	3	CO2	U
ii)	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	Ap
iii)	An electron is bound in a one dimensional potential well of width 2 A^0 and of infinite height. Find its energy values in ground state and first two excited states.	3	CO3	Ap
iv)	What is the probability of an electron being thermally excited to conduction band in intrinsic Si at 27 ^{0}C. The band gap energy of Si is 1.12 eV.	3	CO3	Ap
v)	How does supercapacitor differ from battery? Can we replace supercapacitor with battery?	3	CO6	U
vi)	State Meissner's effect. Why superconductor is termed as a perfect diamagnet?	3	CO5	U
Q.2	Solve any three questions out of four.	15		
i)	State Heisenberg's Uncertainty Principle. Using Heisenberg's Uncertainty Principle, show that electron cannot exist within the nucleus.	5	CO1	Ap

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ii)	Derive one dimensional Schrodinger's Time Dependent wave equation.	5	CO1	U
iii)	What is effect of increasing temperature and doping concentration on Fermi Energy in n-type semiconductor? Explain with necessary diagram.	5	CO3	U
iv)	The n-type Ge sample has donor concentration $10^{21}/m^3$ and thickness = 3 mm across which Hall voltage is developed is used in a Hall effect experiment set up. If B = 0.5 T, J = 500 A/m^3, Find Hall voltage and Hall Coefficient R_H.	5	CO3	Ap
Q.3	Solve any three questions out of four.	15		
i)	What do you mean by anti-reflecting coating? What should be refractive index of anti-reflecting coating on glass surface? Obtain the relation for a minimum thickness of the coating?	5	CO4	U
ii)	Define critical temperature and critical field in superconductors. Critical field of a metal is3×10^5 A/m at 6K and 4×10^5 at 0K. Calculate its critical temperature.	5	CO5	Ap
iii)	In cubic crystals, derive the expression for interplanar distance in terms of lattice parameter and Miller indices.	5	CO2	U
iv)	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	Ap

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