K. J. Somaiya Institute of Engineering and Information Technology, Sion, Mumbai-22

(Autonomous College Affiliated to University of Mumbai)

End Semester Exam

Nov – Dec 2021 (Held in March 2022)

Program: B.Tech.

Examination: FY Semester: I

Course Code: 1UBSC102 and Course Name: Engineering Physics

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 and explain it on the basis of Bohr's postulate.	3	1	2
ii)	An electron has a speed of 900 m/s with an accuracy of 0.001%. Calculate the uncertainty in the position of the electron.	3	1	3
iii)	Draw the following planes (1 2 3), (110), $(2\bar{3}1)$ in a cubic unit cell.	3	2	2
iv)	Explain the effect of increasing doping level on Fermi level in n-type semiconductor and p-type semiconductor?	3	3	2
v)	The resistivity of intrinsic InSb at room temperature is 2×10^{-4} ohm-cm. If the mobility of electron is 6 m^2/V-sec and mobility of hole is 0.2 m^2/V-sec, calculate its intrinsic carrier density.	3	3	3
vi)	How can we use wedge shaped film to determine diameter of a thin wire?	3	4	2

Q.2	**Solve any three questions out of four.**	**15**		
i)	Using Heisenberg's Uncertainty Principle, show that electron cannot exist within the nucleus.	5	1	2
ii)	A bullet of mass 40 gm and an electron both travel with the velocity of 1100 m/s. What wavelengths can be associated with them? Why the wave nature of bullet can not be revealed using diffraction effect?	5	1	3
iii)	How a p-n junction diode can be used to generate potential difference in a photovoltaic solar cell?	5	3	2
iv)	In a Hall effect experiment, a potential difference of 4.5μV is developed across a foil of zinc of thickness 0.02 mm, when a current of 1.5 A is flowing in a direction perpendicular to applied magnetic field of 2 tesla. Calculate a) Hall coefficient for zinc b) concentration of electrons.	5	3	3
Q.3	**Solve any three questions out of four.**	**15**		
i)	Derive an expression for inter-planar spacing for the planes having (h k l) as the miller indices.	5	2	2
ii)	X-rays of wavelength 1.5418 A^0 are diffracted by (111) planes in a crystal at an angle of 30^0 in the first order. Calculate the lattice constant of the cubic unit cell.	5	2	3
iii)	Derive the relation between angle of wedge and fringe-width in wedge shaped film experiment.	5	4	2
iv)	A Newton's ring setup is used with a source emitting two wavelengths $\lambda_1 = 6000\ A^0$ and $\lambda_2 = 4500\ A^0$. , The n^{th} dark ring due to λ_1 coincides with $(n+1)^{th}$ dark ring due to λ_2. If the radius of curvature of the lens is 90 cm, find the diameter of the n^{th} dark ring of 6000 A^0.	5	4	3