

\* May-June 2023

(B. Tech ) Program: First Year Scheme I/II: II

Examination: FY Semester: I

Course Code: BSC102 and Course Name: Engineering Physics

Date of Exam: 24/06/2023

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
<b>Q 1</b>	<b>Solve any 5 questions out of six</b>	<b>15</b>		
i)	Obtain an expression for de Broglie wavelength $\lambda$ for charge particle accelerated by potential difference V	3	CO1	APP
ii)	Derive Bragg's law for crystal diffraction.	3	CO2	U
iii)	What is the effect of increasing temperature on Fermi level in intrinsic semiconductor, n-type semiconductor and p-type semiconductor?	3	CO3	APP
iv)	Find resistivity of Ge at 300 K. Given density of carriers is $2.5 \times 10^{19} / \text{m}^3$ . Mobility of electrons is $0.39 \text{ m}^2/\text{V-sec}$ , mobility of holes = $0.19 \text{ m}^2/\text{V-sec}$ .	3	CO3	U
v)	Why Newton's rings are circular in nature? Show that rings become thinner with increasing order of the rings.	3	CO4	U
vi)	Define critical temperature and critical magnetic field for superconductor. Draw a plot to show relationship between them.	3	CO5	U
<b>Q.2</b>	<b>Solve any three questions out of four.</b>	<b>15</b>		
i)	Show that matter wave associated with moving particles travels in the form of group of waves.	5	CO1	U
ii)	An electron confined in a box of length $1 \text{ \AA}$ . Calculate minimum uncertainty in its velocity.	5	CO1	APP
iii)	How does Hall voltage induce? Obtain expression of Hall coefficient and state its significance.	5	CO3	U

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iv)	What is the probability of an electron being thermally promoted to conduction band in diamond at 27 <sup>0</sup> C if bandgap is 5.6 eV wide.	5	CO3	APP
<b>Q.3</b>	<b>Solve any three questions out of four.</b>	<b>15</b>		
i)	What are the miller indices? Derive an expression for inter-planar spacing for the planes having (h k l) as the miller indices.	5	CO2	APP
ii)	A drop of oil of volume 0.2 cc is dropped on the surface of a tank water of area 1 sq. m. The film spreads uniformly over the whole surface. White light which is incident normally on the surface is observed through spectroscope. The spectrum is seen to contain one dark band whose centre has wavelength 5500 Å in air. Find the refractive index of the given oil.	5	CO4	U
iii)	Light containing two wavelengths $\lambda_1$ and $\lambda_2$ falls normally on a convex lens of radius of curvature R, resting on a glass plate. Now, if n <sup>th</sup> dark ring due to $\lambda_1$ coincides with (n+1) <sup>th</sup> dark ring due to $\lambda_2$ , then prove that the radius of the n <sup>th</sup> dark ring due to $\lambda_1$ is $\sqrt{\frac{\lambda_1 \lambda_2 R}{\lambda_1 - \lambda_2}}$	5	CO4	APP
iv)	Prove that superconductor is a perfect diamagnet.	5	CO5	U

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