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

May-June 2025
Program: B. Tech Scheme : III / II
Regular Examination: FY/ Semester: II
Course Code: BSC202 and Course Name: Physics and Nanotechnology
Date of Exam: 04/06/25 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)	Explain how magnetic nanomaterials can be used in targeted drug delivery?	3	5	U
ii)	Differentiate between the Top Down approach and Bottom Up approach used for producing nanomaterials.	3	6	U
iii)	What does LASER stand for? In what respect it differ from an ordinary source of light?	3	2	U
iv)	Sodium light of wavelength 5890 A^0 falls normally on a plane diffraction grating having 6000 lines per centimeter. How many diffraction orders will be observed?	3	1	Ap
v)	Two vectors are given by - $\vec{A} = 1\hat{x} + 0\hat{y} + 1\hat{z}$ and $\vec{B} = 0\hat{x} + 1\hat{y} + 1\hat{z}$. Find the angle between $\vec{A}$ and $\vec{B}$ using dot product.	3	4	Ap
vi)	The numerical aperture of an optical fibre is 0.5 and core refractive index is 1.54. Find refractive index of cladding and acceptance angle.	3	3	Ap
Q.2	Solve any three questions out of four.	15		
i)	How X-ray diffraction is used to find the size of nanocrystallite?	5	6	U

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ii)	What is the advantage of increasing the number of lines in the grating? Calculate minimum number of lines required on the grating so that it will just resolve the sodium lines in the first order spectrum. The wavelengths are $5890A^0$ and $5896A^0$.	5	1	U
iii)	Explain with suitable diagram, ball milling method used for synthesis of nanomaterials? State advantages and disadvantages of this method.	5	6	U
iv)	Explain fibre optic communication system with a diagram. What are advantages of using optical fibre?	5	3	U
Q.3	Solve any three questions out of four.	15		
i)	What is holography? Explain the construction of hologram and reconstruction of image from hologram with suitable diagrams.	5	2	U
ii)	a) Find the gradient of $r = \sqrt{x^2 + y^2 + z^2}$. b) If $\vec{v} = x\,\hat{x} + y\,\hat{y} + z\,\hat{z}$, calculate its curl.	5	4	Ap
iii)	State Gauss law for electric field. Derive first Maxwell's equation.	5	4	U
iv)	Categorize nanomaterials based on their number of nanoscale dimensions. Give example of each category.	5	5	U

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