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

May-June 2024
Program: B. Tech Scheme : III
Regular Examination: FY/ Semester: II
Course Code: BSC202 and Course Name: Physics and Nanotechnology
Date of Exam: 27-05-2024 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)	What is the difference between holography and photography?	3	2	2
ii)	Calculate the angular position of the first minimum in Fraunhoffer diffraction at slit of width 10^{-6} m wide if it is illuminated by light of wavelength 4000 A^0.	3	1	3
iii)	Find the separation vector $\vec{r}$ from the source point (2,8,7) to the field point (4,8,6). Determine its magnitude.	3	4	3
iv)	Differentiate between top down approach and bottom up approach used to synthesize nanomaterials?	3	6	2
v)	Explain in brief two reasons behind change in optical properties at nano scale?	3	5	2
vi)	The numerical aperture of an optical fibre is 0.5 and core refractive index is 1.54. Find refractive index of cladding.	3	3	3
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	2
ii)	Explain fibre optic communication system with a diagram. What are advantages of using optical fibre?	5	3	2
iii)	Explain construction and working of Transmission Electron Microscope.	5	6	2

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iv)	Explain how number of lines on grating decides the maximum number of orders of diffraction? 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?	5	1	3
Q.3	Solve any three questions out of four.	15		
i)	What is the significance of curl of a vector field? Determine the curl of vector field $\vec{B} = yz\,\hat{x} + 4xy\,\hat{y} + y\,\hat{z}$.	5	4	3
ii)	With a neat sketch explain construction and working of Nd-YAG laser.	5	2	2
iii)	Describe any five applications of nanotechnology in brief.	5	5	2
iv)	State Gauss law for electric field. Derive first Maxwell's equation.	5	4	2

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