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

May-June 2023
(B. Tech) Program: First Year Scheme I/II: I
Examination: FY Semester: II
Course Code: 1UBSC202 and Course Name: Physics & Nanotechnology
Date of Exam: 29/05/2023 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
Q 1	Solve any 5 questions out of six.	15		
i)	Distinguish between LASER and ordinary light.	3	2	2
ii)	Define population inversion and its importance in lasing action.	3	2	2
iii)	What is the Rayleigh criterion of resolution?	3	1	2
iv)	Find the gradient of V = $7x^2yz - xz$	3	3	3
v)	Explain the statement – "Magnetic monopoles does not exist" using Maxwell's equation.	3	3	2
vi)	What are nano materials? What is significance of surface area to volume ratio in nanomaterials.	3	4	2
Q.2	Solve any three questions out of four.	15		
i)	Explain the experimental method to determine the wavelength of spectral line using diffraction grating.	5	1	2
ii)	What is the highest order spectrum that can be seen with monochromatic light of wavelength 6000 x 10^{-10} m by means of diffraction grating having 5000 lines/cm? Also calculate Grating Element of the grating.	5	1	3
iii)	Find curl and divergence of $\vec{A} = \cos x\,\hat{x} - 2\sin y\,\hat{y} + xy^2\hat{z}$, at point (1,-1,1).	5	3	3
iv)	Derive Maxwell's third equation for time varying fields.	5	3	2

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Q.3	Solve any three questions out of four.	15		
i)	With a neat diagram explain construction and working of Nd-YAG laser.	5	2	2
ii)	Explain fiber optic communication system with a diagram. What are advantages of using optical fiber?	5	2	3
iii)	The numerical aperture of a fiber is 0.5 and core refractive index is 1.48. Find the refractive index of cladding, the critical angle and acceptance angle of the fiber.	5	2	3
iv)	Describe any five applications of nanotechnology in brief.	5	4	3

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