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

Subject Code: 1UBSC202 Subject Name: Physics and Nanotechnology Date: 07-07-2022

April – May 2022 (Held in July 2022)
Program: B.Tech
Examination: FY Semester: II
Course Code: 1UBSC202 and Course Name: Physics and Nanotechnology

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 Rayleigh criterion of resolution?	3	1	2
ii)	Distinguish between a hologram and a photograph.	3	2	2
iii)	Explain the role of resonant cavity in the operation of a laser.	3	2	2
iv)	What is the gradient of a scalar field? State its physical significance?	3	3	2
v)	Explain the statement – "Magnetic monopoles does not exist" using Maxwell's equation.	3	3	2
vi)	What is the reason behind change in optical properties at nano scale?	3	4	2
Q.2	**Solve any three questions out of four.**	**15**		
i)	Show that the resultant amplitude of wave disturbance at any point on the screen due Fraunhofer diffraction at single slit depends on angle of diffraction.	5	1	2
ii)	What is the highest order spectrum that can be seen with monochromatic light of wavelength 6000 A.U. by means of a diffraction grating that has 5000 lines/cm? Also calculate Grating Element of this grating.	5	1	3
iii)	Determine the divergence and curl of vector field $\vec{F} = y\,\hat{x} + (x^3 - x)\,\hat{y} + 4y^2\,\hat{k}$. State whether the vector is solenoidal or irrotational.	5	3	3
iv)	Write Maxwell's equations in differential form and mention their physical significance.	5	3	2

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Q.3	**Solve any three questions out of four.**	**15**		
i)	Explain fibre optic communication system with a neat diagram. What are advantages of using optical fibre?	5	2	2
ii)	Explain construction and working of semiconductor laser.	5	2	2
iii)	An optical fibre has a numerical aperture 0.54 with refractive index of the core as 1.48. Find refractive index of the cladding, acceptance angle and critical angle for the core cladding pair.	5	2	3
iv)	How nanomaterials are classified based on dimensions.	5	4	3

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