

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: 14/12/2022

Program: B.Tech. Nov/Dec 2022 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)	Sodium light of wavelength 5890 \AA falls normally on a plane diffraction grating having 6000 lines per centimeter. How many diffraction orders will be observed?	3	1	3
ii)	What is pumping in laser? Mention the types of pumping methods.	3	2	2
iii)	How optical fibre can be used in smoke sensing application?	3	2	2
iv)	Find the gradient of $V = x^2 + y^2 + z$	3	3	3
v)	Write Maxwell's equation for Gauss law for electric field. What is its significance?	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)	Monochromatic light of wavelength 6560 \AA falls normally on a grating of 2 cm wide. The first order spectrum is produced at an angle of 19° from the normal. What is the total number of lines on the grating?	5	1	3
ii)	Obtain the relation for width of a central maximum obtained in single slit diffraction experiment.	5	1	2
iii)	What is curl of a vector field? Give its significance. Determine the curl of vector field $\vec{B} = yz \hat{x} + 4xy \hat{y} + y \hat{k}$.	5	3	3
iv)	State Faraday's law. Obtain third Maxwell's equation for static field and varying field.	5	3	2

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Q.3	Solve any three questions out of four.	15		
i)	With a neat energy level diagram, describe the construction and working of He-Ne laser.	5	2	2
ii)	Derive the expression for numerical aperture for a step index optical fibre. Calculate the numerical aperture of a fibre with core index 1.65 and cladding index 1.53.	5	2	3
iii)	An optical fibre has core diameter of 6 micrometer and core refractive index is 1.45. The critical angle is 87° . Calculate i) refractive index of cladding, ii) acceptance angle and iii) number of modes propagating through fibre when wavelength of light is 1 micrometer	5	2	3
iv)	Give classification of nanomaterials based on dimensions.	5	4	2
