

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

Supplementary Exam August 2023		
Program: B. Tech	Scheme I/II: II	
Examination: FY	Semester: II	
Course Code: BSC202 and Course Name: Physics and Nanotechnology		
Date of Exam: 10-08-2023	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)	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 the role of resonant cavity in the operation of laser?	3	2	2
iii)	How optical fibre can be used in temperature sensing application?	3	3	2
iv)	Find the gradient of $r = \sqrt{x^2 + y^2 + z^2}$.	3	4	3
v)	How to find curl of a vector field?	3	4	2
vi)	Why the mechanical properties of material change at nano scale? Give one example.	3	5	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)	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
iii)	With a neat energy level diagram, describe the construction and working of He-Ne laser.	5	2	2
iv)	Find the core radius necessary for single mode operation at 850 nm in step index fibre with core refractive index 1.480 and cladding refractive index 1.47. What is the numerical aperture and maximum acceptance angle of this fibre.	5	3	3

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

Supplementary Exam August 2023		
Program: B. Tech	Scheme I/II: II	
Examination: FY	Semester: II	
Course Code: BSC202 and Course Name: Physics and Nanotechnology		
Date of Exam: 10-08-2023	Duration: 02 Hours	Max. Marks: 45

Q.3	Solve any three questions out of four.	15		
i)	State Gauss law for electric field. Derive first Maxwell's equation.	5	4	2
ii)	State Faraday's law. Obtain third Maxwell's equation for static field and varying field.	5	4	3
iii)	What is the significance of divergence of a vector field? Determine the divergence of vector field $\vec{F} = x^2y \hat{x} + (x^3 - x) \hat{y} + 4y^2 \hat{z}$.	5	4	3
iv)	What are types of nanomaterials on the basis of dimensions. Write examples of each type.	5	5	2
