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

July/Aug ~~May-June~~ 2025
Program: B. Tech Scheme : III
Supplementary ~~Regular~~ Examination: FY/ Semester: II
Course Code: BSC202 and Course Name: Physics and Nanotechnology
Date of Exam: 31/07/25   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 are nanomaterials? What happens to the surface area to volume ration in nanomaterials? What is significance of surface area to volume ratio in nanomaterials?	3	5	U
ii)	With suitable diagram explain how Chemical Vapour Deposition Method is used to synthesize nanomaterials.	3	6	U
iii)	How resonant cavity is formed in lasers? What is the role of resonant cavity in the operation of laser?	3	2	U
iv)	A grating of width 2 inches is ruled with 15000 lines per inch. Find the smallest wavelength separation that can be resolved in second order at a wavelength of 5000 A^0.	3	1	Ap
v)	Find the separation vector $\vec{r}$ from the source point (2,3,1) to the field point (4,1,3). Determine its magnitude.	3	4	Ap
vi)	Numerical aperture of a fibre is 0.5 and core refractive index is 1.48. Find cladding refractive index and acceptance angle.	3	3	Ap
Q.2	Solve any three questions out of four.	15		
i)	Explain construction and working of Scanning Electron Microscope.	5	6	U
ii)	Obtain the relation for width of central maximum obtained in single slit diffraction experiment.	5	1	U

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iii)	Explain with suitable diagram, Physical Vapour Deposition Method (resistive method and sputtering method) used for synthesis of nanomaterials	5	6	U
iv)	Find the core radius necessary for single mode operation at 850 nm in step index fibre with $n_1 = 1.480$ and $n_2 = 1.47$. What is the numerical aperture and maximum acceptance angle of this fibre.	5	3	Ap
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. What are its advantages?	5	2	U
ii)	If $\vec{v_A} = x\,\hat{x} + y\,\hat{y} + z\,\hat{z}$ and $\vec{v_B} = y\,\hat{y}$ calculate their divergence. Calculate curl of $\vec{v} = -y\hat{x} + x\hat{y}$.	5	4	Ap
iii)	State Ampere's circuital law. Obtain fourth Maxwell's equation for static field. Write it for time varying field.	5	4	U
iv)	Explain with example how nanomaterials are classified according to their dimensional structure?	5	5	U

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