

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

May-June 2026/Nov-Dec 2026/July-Aug 2026/Feb-March 2026		
Program: <u>B Tech</u> Scheme I/II/III/IV		
Regular/Supplementary Examination: <u>FY/SY/TY/LY</u> Semester: I/II/III/IV/V/VI/VII/VIII		
Course Code: BSC202 and Course Name: Physics & Nanotechnology		
Date of Exam: 27/05/2026	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.	15		
i)	Find the gradient of $r = \sqrt{x^2 + y^2 + z^2}$	3	CO4	Ap
ii)	A grating has 15 cm of the surface ruled with 6000 lines per cm. What is the resolving power of the grating in the first order?	3	CO1	Ap
iii)	What are nano materials? What is significance of surface area to volume ratio in nano materials.	3	CO5	U
iv)	State the formula used to determine the nanocrystallite size from an X-ray diffraction (XRD) pattern and explain the terms involved in the formula.	3	CO6	U
v)	Calculate the acceptance angle for an optical fibre whose core refractive index is 1.48 and cladding refractive index is 1.39.	3	CO3	Ap
vi)	What is the role of resonant cavity in the operation of laser?	3	CO2	U
vii)	If $\vec{A} = x^2z \hat{x} - 2y^2z^2 \hat{y} + xy^2z \hat{z}$, Find $\vec{\nabla} \cdot \vec{A}$	3	CO4	Ap
Q.2	Solve any three questions out of four.	15		
i)	A diffraction grating used at normal incidence, gives a line 5400 Å in a certain order, which is superimposed on the other line 4050 Å of the next order. If the angle of diffraction is 38°, how many lines/cm are there in the grating?	5	CO1	Ap
ii)	Derive the expression for numerical aperture for a step index optical fibre.	5	CO3	U

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iii)	Explain Construction and working of Scanning Electron Microscope (SEM)	5	CO6	U
iv)	Explain the synthesis of nanomaterials using the Physical Vapour Deposition Sputtering technique with a neat diagram.	5	CO6	U
Q.3	Solve any three questions out of four.	15		
i)	State Faraday's law. Obtain third Maxwell's equation for static field and varying field.	5	CO4	U
ii)	What is the significance of curl of a vector field? Calculate curl of $\vec{v} = -y\hat{x} + x\hat{y}$.	5	CO4	Ap
iii)	Classify nanomaterials based on dimensions with examples.	5	CO5	U
iv)	With a neat sketch explain construction and working of He-Ne laser.	5	CO2	U
