

# CBCS SCHEME



BETCK105C/BETCKC105

First Semester B.E./B.Tech. Degree Examination, Dec.2023/Jan.2024

## Introduction to Nano Technology

Time: 3 hrs.

Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.  
2. M : Marks , L: Bloom's level , C: Course outcomes.

Module – 1			M	L	C
Q.1	a.	Explain the sputtering technique for the preparation of nanomaterials. Mention any three advantages.	8	L2	CO1
	b.	Illustrate how optical, electrical and catalytic properties vary from bulk to nanomaterials.	8	L3	CO1
	c.	Explain the electron confinement in 0D, 1D, 2D, 3D systems with examples.	4	L2	CO1
OR					
Q.2	a.	Explain the steps involved in the synthesis of Silica nanoparticles by taking sol-gel method.	8	L2	CO1
	b.	Describe ball milling method to synthesize the nanoparticles with diagram.	8	L2	CO1
	c.	Explain the chemical bath deposition method.	4	L2	CO1
Module – 2					
Q.3	a.	Explain the basic principles, working and instrumentation of Tunneling Electron Microscope (TEM).	8	L2	CO2
	b.	Explain the contact, nocontact and tapping imaging modes of the Atomic Force Microscope (AFM).	8	L2	CO2
	c.	Explain the basic principle of working of X-ray diffraction.	4	L2	CO2
OR					
Q.4	a.	Explain the principle and instrumentation of UV-visible spectroscopy.	8	L2	CO2
	b.	Explain the basic principle, working and instrumentation of Scanning Tunneling Microscope (STM).	8	L2	CO2
	c.	In a X-ray diffraction experiment, Peak Width Half Maxima (FWHM) is $0.6^\circ$ and its braggangle ( $\theta$ ) is $24^\circ$ . Calculate the crystallite size using Scherrer equation. Given wavelength used in X-ray diffraction experiment is $1.54 \text{ \AA}$ . Given, $K = 0.94$ .	4	L3	CO2
Module – 3					
Q.5	a.	Write a note on (i) Carbon nanocomposites (ii) Carbon nano diamonds.	8	L2	CO3
	b.	Explain the synthesis, electrical, mechanical properties of fullerenes. Mention its applications.	8	L2	CO3
	c.	Write a note on Carbon nanofibers.	4	L2	CO3
OR					
Q.6	a.	Explain the electrical and mechanical properties of Single Walled Carbon Nanotubes (SWCNT's) and Multi Walled Carbon Nanotubes (MWCNT's).	8	L2	CO3
	b.	Explain the synthesis of graphene by chemical vapor deposition. Explain the application of SWCNT's and MWCNT's.	8	L2	CO3
	c.	Write a note on Carbon nanofibers.	4	L2	CO3
Module – 4					
Q.7	a.	Describe the construction and working of Quantum dot solar cells.	8	L2	CO4
	b.	Explain the construction and working of fuel cells.	8	L2	CO4
	c.	Explain the requirements of anode, cathode materials for Lithium-ion battery.	4	L2	CO4

OR					
Q.8	a.	Define solar cells. Exemplify briefly 1 <sup>st</sup> , 2 <sup>nd</sup> and 3 <sup>rd</sup> generations of solar cells.	8	L3	CO4
	b.	Explain the construction and working of Lithium ion battery.	8	L2	CO4
	c.	Discuss the limitations of graphite anodes.	4	L2	CO4
Module – 5					
Q.9	a.	Define Nanoelectronics. Explain the application of nanotechnology in contact lenses, detector for Heart attacks, tiny 3D printed batteries, creating biodegradable electrodes.	8	L2	CO5
	b.	Identify and explain the nanotechnology application in computing and optical area.	8	L3	CO5
	c.	Define the following terms : (i) Nanobiotechnology (ii) Nanocomputing (iii) Nanochemistry (iv) Nanophotonics.	4	L2	CO5
OR					
Q.10	a.	Explain the application of nanotechnology in diagnosis and drug delivery.	8	L2	CO5
	b.	Explain the application of nanotechnology in agricultural and food field.	8	L2	CO5
	c.	Write a note on nanofertilizers.	4	L2	CO5

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