BETCK105C/205C

Visvesvaraya Technological University, Belagavi.

Model Question Paper-I with effect from 2022-23(CBCS Scheme)

First/Second Semester B.E. Degree Examination

USN:

Introduction to Nanotechnology

TIME:03 Hours **Max.Marks:**100

Note: Answer any **FIVE** full questions, choosing at least **ONE** question from each **Module**.

QNo.		Module– 1	Marks
Q1	a	Describe the Sputtering technique for the preparation of nanomaterials. Mention itsadvantages and drawbacks.	8
	b	Write a note on a) surface to volume ratio b) precipitation for the synthesis of nanomaterials.	8
	c	Define the terms i) Nanomaterials ii) Quantum confinement	4
		OR	
Q2	a	Explain how optical, electrical and catalytical properties vary from bulk to nanomaterials.	8
	b	Explain the steps involved in synthesis of silica nanoparticles by taking sol gel method.	8
	c	Explain the electronconfinement in OD, 1D, 2D, 3D systems with examples.	4
		Module– 2	
Q3	a	Explain the basic principle, working and instrumentation of scanning electron microscope with diagram.	8
	b	Explain the basic principle, working and instrumentation of Scanning Tunnelling Microscope (STM).	8
	c	Explain the basic principles of working of X-ray diffraction	4
		OR	
Q4	a	Explain the contact, no-contact and tapping imaging modes of the AtomicForce Microscope (AFM).Mention any four differences between STM & AFM.	8
	b	Explain the working and instrumentation of the IR spectroscopy. Mention its application in the determination of functional group.	8
	c	In a X-raydiffraction experiment peak width half maxima (FWHM) is 0.6 o and its bragangle (θ) is 24^{o}. Calculate the crystallite size using Scherrer equation. Givenwavelength used in X-ray diffraction experiment is 1.54 Å. Given, k =0.94	4
		Module– 3	
	a	Explain the synthesis of graphene by chemical vapor deposition. Mention	8

Q5		electrical, electronic & mechanical properties of graphene.	
	b	Explain the electronicand mechanical properties of singlewalled carbon nanotubes (SWCNT's)& multi walled carbon nanotubes (MWCNT's).	**8**
	c	Explain the Synthesis of SWCNT & MWCNT by chemical vapor deposition.	**4**
OR			
Q6	**a**	Write a note on a) carbon nanocomposites b) nanodiamonds	**8**
	b	Explain the Synthesis, electrical, mechanical properties of fullerenes. Mention its applications.	**8**
	c	Write a note on carbon nanofibers.	**4**
Module-4			
Q7	**a**	Define Solar cells. Describe briefly 1^{st}, 2^{nd}& 3^{rd}generations of Solar cells.	**8**
	b	Explain the construction and working of Fuel cells.	**8**
	c	Mention the limitations ofgraphite anodes.	**4**
OR			
Q8	**a**	Describe the construction and working of Dye-sensitized solar cells solar cells.	**8**
	b	Describe the construction and working of Lithium-ion battery	**8**
	c	Explain the requirements of anode, cathode materials for the Lithium-ion battery.	**4**
Module-5			
Q9	**a**	Explain the application of nanotechnology indiagnosis&drug delivery.	**8**
	b	Define nanophotonic. Explain optical applications of the nanotechnology.	**8**
	c	Write a note on nano fertilizers.	**4**
Q10	**a**	Explain the nanotechnology application in contact lenses, detector for Heart Attacks, tiny 3-D Printed Batteries, creating Biodegradable Electrodes.	**8**
	b	Explain the application of nanotechnology in agricultural and food field.	**8**
	c	Define the following terms: a. Nanobiotechnology b. Nanocomputing c. Nanoelectronics c. Nano chemistry	**4**