Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
A Constituent Institution of Manipal University

VI SEM B.TECH. (BME) DEGREE END SEMESTER EXAMINATIONS, APRIL 2018
SUBJECT: INTRODUCTION TO BIOMEDICAL NANOTECHNOLOGY (BME 4012)
Thursday, 26th April 2018, 2 PM-5 PM

TIME: 3 HOURS **MAX. MARKS: 100**

Instructions to Candidates:

1. **Answer ALL questions.**
2. **Draw labeled diagram wherever necessary**

1.	(a)	Explain "LaMer's Mechanism" of nanoparticle synthesis.	5
	(b)	Explain the influence of surface area-to-volume ratio on the surface energy of nanomaterials.	5
	(c)	Describe the "quantum confinement effect" in semiconductor nanoparticles.	10
2.	(a)	Explain the "Two-Microemulsion" method of nanomaterial synthesis, for the following reaction. $Zn(NO_3)_2 + 2NaOH \rightarrow ZnO + 2NaNO_3 + H_2O$ $Zn(NO_3)_2$: - Zinc nitrate NaOH: - Sodium hydroxide $NaNO_3$: - Sodium nitrate ZnO: - Zinc oxide	10
	(b)	Explain in detail, the characterization technique which can be used for confirming the functionalization of the ZnO nanoparticles with oleic acid.	10
3.	(a)	Explain pulsed laser deposition, and electron beam evaporation method, towards preparing nanomaterials.	10
	(b)	Explain the principle behind and operation modes of Atomic Force Microscopy (AFM).	10

4.	(a)	Explain Fluorescence Resonance Energy Transfer (FRET) for biosensing, and give a design-example.	10
	(b)	Design multifunctional nanoparticles for pH induced intracellular drug delivery and enhanced Magnetic Resonance Imaging (MRI) contrast characteristics.	10
5.	(a)	Explain the concept involved in photo thermal therapy using nanomaterials.	10
	(b)	Explain in detail, the “biological fate” of nanomaterials.	10