Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

(A constituent unit of MAHE, Manipal 576104)

VI SEMESTER B.Tech.(BME) DEGREE END SEM EXAMINATIONS APR/MAY 2019
SUBJECT: INTRODUCTION TO BIOMEDICAL NANOTECHNOLOGY (BME 4012)
Elective III
(REVISED CREDIT SYSTEM)
Friday, 3rd May 2019: 2.00 pm to 5.00 pm

TIME: 3 HOURS **MAX. MARKS: 50**

Instructions to Candidates:

1. **Answer all the questions.**
2. **Draw labeled diagrams wherever necessary.**

1. (a) Discuss the process of Ostwald ripening. 03

(b) Instead of "shining yellowish colour", the gold nanoparticles prepared by Michael Faraday was having **red colour**. Discuss in detail the reason behind this color change. 03

(c) You have prepared ZnO nanoparticles using Zinc nitrate and NaOH as reactants: Sample details are given below: 04

Sample 1 :- contains ZnO nanoparticles with diameter 2 nm
Sample 2 :- contains ZnO nanoparticles with diameter 5 nm
Sample 3 :- contains ZnO nanoparticles with diameter 10 nm

Which one of these samples will show maximum agglomeration of ZnO nanoparticles? **Justify your answer with appropriate reasons.**

2. (a) Describe physical vapor deposition method (PVD) for nanomaterial synthesis 03

(b) Explain microwave assisted and sonochemical synthesis of nanomaterials. 02

(c) You have prepared zinc oxide nanoparticles (ZnO) using zinc nitrate and sodium hydroxide as reactants: 05
Suggest a characterization technique to understand the **crystalline phase** and **crystallite size** of the nanoparticle.
Justify your suggestion with detailed explanation on the characterization technique.

3. (a) What is hydrodynamic radius? Explain the characterization technique which can be used to measure the hydrodynamic radius of the nanoparticles. 05

(b) You have prepared ZnO nanoparticles using Zinc nitrate and NaOH as reactants and functionalized it with oleic acid molecules: 05
Suggest a characterization technique to understand the nature of this surface functionalization.
Justify your suggestion with detailed explanation on the characterization technique.

4. (a) Design a nano-system to induce **targeted photo thermal therapy (PTT)** with **doxorubicin delivery** in the tumor tissue which can also act as **an MRI contrast agent**. Justify your design concepts. 07

(b) Explain in detail the principle of photodynamic therapy (PDT). 03

5. (a) Design a strategy for drug delivery in which release of the drug will be activated by Fluorescence Resonance Energy Transfer (FRET). 07

(b) Explain in detail colloidal lithographic and phase separation methods for the preparation of polymer tissue engineering scaffold 03