Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

II SEMESTER M.TECH. (CHEMICAL ENGINEERING)

END SEMESTER EXAMINATIONS, APRIL / MAY 2017

SUBJECT: Elective- III : Nano Science and Technology [CHE 5239]

(29/04/2017)

Time: 3 Hours **MAX. MARKS: 100**

Instructions to Candidates:

- Answer **ALL** questions.
- Missing data may be suitably assumed and indicated properly

1A.	Define: Nanoparticle. List the various properties of nanoparticles that could be exploited for making efficient devices/ processes. Explain chemical engineering applications (applied to both Unit Operations & Unit Processes) of nanoparticles?	**(06)**
1B.	What is a nanofluid? Give examples? What are its applications?	**(04)**
1C.	What are two basic methods of synthesis of nanofluids? Explain the synthesis of a Al_2O_3 nano fluid with a neat flow diagram, the chemical equations involved and the parameters controlling the synthesis.	**(10)**
2A.	What are the challenges and opportunities in the synthesis of nano materials? Explain	**(04)**
2B.	Explain the two basic types of emulsion used for nano material synthesis? Give figures and examples.	**(04)**
2C.	Explain the synthesis of (i) nano **Cu** (ii) nano **ZnO** by the emulsion method with neat flow diagram giving the chemical equations involved and the parameters controlling the synthesis	**(12)**
3A.	How are nano materials classified? Explain with examples and neat figures.	**(08)**

3C.	Explain the synthesis of dry powder of a nano **Pd** by the two basic methods of (i) top down method of synthesis (ii) bottom up method (wet chemical method) of synthesis with neat flow diagram giving the chemical equations involved and the parameters controlling the synthesis	**(12)**
4A.	Calculate the % of surface atoms in gold (Au) cube of size: (i) 1 cm (ii) 1nm *Data*: Au has FCC unit cell with the lattice constant = 0.4nm	**(06)**
4B	Explain the role of nano materials in: (i) Pollution abatement (ii) Energy production and Energy storage (iii) Nano composites	**(08)**
4C.	What is zeta potential? What are the methods used for stabilizing nano particle suspensions? Explain with neat figures	**(06)**
5.	Write on: (i) Synthesis and applications of bi- metal (**Cu- Pd**) and bi-metal oxide (**CuO - ZnO**) nanoparticles (ii) Characterization methods of nano particles (iii) Use of ultrasound in the synthesis of nano materials	**(08)** **(06)** **(06)**

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