Ref. No.: Ex/Che/PE/B/T/414F/2023(S)

B.E. CHEMICAL ENGINEERING FOURTH YEAR FIRST SEMESTER SUPPLEMENTARY EXAM 2023

INTRODUCTION TO NANO-SCIENCE & ENGINEERING

Time: 3 Hours Full Marks: 100

*Answer **Any Five** questions*

Clearly mention all the assumptions

Clearly mention your name and roll number on the answer script as well on the graphs

Q. No 1		Q. No 2	Q. No 3	Q. No 4	Q. No 5	Q. No 6	Q. No 7
CO 1	10	10					
CO2							20
CO3		10	10				
CO4			10	10	10	10	
CO 5	10			10	10	10	

1. a) Mention the differences of nanomaterial and nanostructured material.

   b) Mention characteristic features of nanomaterial and bulk material. Illustrate the classification of nanomaterials by dimensional analysis.

   10+10

2. a) Mention the parameters to control during nanoparticle synthesis by ball milling process.
   b) Illustrate the principle of physical vapor deposition method with specific mention of types, steps involved and application.

   10+10=20

3. a) Mention the working principle, associated steps, imaging method of TEM analysis.
   b) How SEM analysis associated with nanomaterial characterisation.

   10+10=20

4. a) Present a clear schematic of quantum dot synthesis process

   b) Mention characteristic features of quantum dot and application pattern.

   10+10=20

5. a) Mention the working principle of Raman spectroscopy as characterisation tool of nanomaterial.

b) Illustrate top down and bottom up approach of graphene synthesis.

10+10=20

6. a) How the growth rate differs in CVD and LPCVD?

b) Justify application of photolithography in nanomaterial synthesis.

10+10=20

7. Write in brief on the significance of the following in nanomaterial synthesis

i. Chemical vapour Deposition

ii. Arc discharge method

iii. Template Sol gel method

iv. Sputtering **5 ×4=20**