Reg.No. \_\_\_\_\_\_\_\_\_\_\_\_



**End Semester Examination – Nov/Dec – 2018**

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| **Code :** | **17NT3019** | **Duration :** | **3hrs** |
| **Sub. Name :** | **SYNTHESIS AND APPLICATIONS OF NANOMATERIALS** | **Max. marks :** | **100** |

**ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | Differentiate top-down and bottom-up approaches in preparation of nano materials and mention the advantages and disadvantages of each process. | CO1 | 5 |
| b. | Explain in detail, the mechanical alloying and mechanical ball milling processes with suitable example. | CO2 | 15 |
| (OR) | | | | |
| 2. | a. | Define laser ablation. With a neat sketch explain the process of laser ablation and mention its benefits. | CO2 | 10 |
| b. | Schematically sketch and explain in detail, the inert gas condensation technique. | CO2 | 10 |
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| 3. | a. | Explain in detail, the solvothermal and hydrothermal synthesis of nanoparticles with suitable examples. | CO3 | 10 |
| b. | Sketch the experimental setup for spray pyrolysis. Discuss in detail, the various steps involved in spray pyrolysis. | CO3 | 10 |
| (OR) | | | | |
| 4. | a. | Define self assembly. Discuss in detail about the self assembled mono layers. | CO3 | 10 |
| b. | Describe a template. Discuss in detail about templated synthesis with suitable examples. | CO3 | 10 |
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| 5. | a. | Explain in detail, the process of chemical vapour deposition in the synthesis of nanomaterials. | CO5 | 10 |
| b. | Schematically sketch the pulsed laser deposition unit and describe the PLD process in detail. | CO5 | 10 |
| (OR) | | | | |
| 6. | a. | Define sputtering. With a neat sketch explain the process of magnetron sputtering and mention its advantages and disadvantages. | CO5 | 10 |
| b. | Discuss the various steps involved in photo lithography process with a schematic diagram. | CO6 | 5 |
| c. | Differentiate dry etching and wet etching. | CO6 | 5 |
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| 7. | a. | Sketch the different types of carbon nanotubes based on chirality and explain the properties of each. | CO4 | 12 |
| b. | Explain the structure of graphene and mention its advantages. | CO4 | 8 |
| (OR) | | | | |
| 8. | a. | Discuss in detail about the synthesis and applications of core-shell materials and hybrid nanocomposites. | CO4 | 15 |
| b. | Explain the significance of mesoporous materials. | CO4 | 5 |
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|  | | **Compulsory**: |  |  |
| 9. | a. | Explain the principle and design of nanostrcutures as single electron transistor. | CO6 | 15 |
| b. | Define nanobots and mention their biological applications. | CO6 | 5 |