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



**End Semester Examination – Nov/Dec - 2017**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| **Code :** | **16NT3001** | **Duration :** | **3hrs** |
| **Sub. Name :** | **NANOMATERIALS CHARACTERIZATION METHODS** | **Max. Marks** | **100** |

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Q. No. | Sub Div. | Questions | Course  Outcome | Marks |
| 1. | a. | Briefly explain the significance of TGA. | CO2 | 10 |
| b. | Discuss in detail the basics, instrumentation and various factors involved in DTA. | CO2 | 10 |
| (OR) | | | | |
| 2 | a. | Which instrument works on the principle of Dynamic light scattering ? | CO3 | 10 |
|  | b. | What are different imaging modes in AFM? | CO3 | 10 |
| 3 |  | Explain the instrumentation and application of RHEED and LEED. | CO2 | 20 |
|  |  | (OR) |  |  |
| 4 | a. | Which microscope is used to obtain internal details of the sample by allowing electrons to pass through it and explain its instrumentation? | CO3 | 10 |
|  | b. | What are the applications of FIB? | CO2 | 10 |
| 5. | a. | Optical property of the materials can be studied using which technique? | CO2 | 10 |
|  | b. | Schematically explain the principle, instrumentation and advantages of FTIR. | CO2 | 10 |
|  |  | (OR) |  |  |
| 6 | a. | Difference between micro and nanoindentation. | CO3 | 4 |
|  | b. | Techniques used to find thermal properties. | CO2 | 2 |
|  | c. | Types of microscope. | CO3 | 2 |
|  | d. | Difference between light microscope and SEM. | CO3 | 4 |
|  | e. | Difference between compound and simple microscope. | CO3 | 4 |
|  | f. | What are the different sources of electrons? | CO3 | 4 |
| 7 | a. | Discuss the working principle of Raman spectroscopy. | CO1 | 10 |
|  | b. | Which technique is used to study the mechanical properties of the material? | CO1 | 10 |
|  |  | (OR) |  |  |
| 8 | a. | Draw the schematic diagram of SEM and explain the various components. | CO3 | 10 |
|  | b. | What are various signals emitted from the sample in SEM. | CO3 | 5 |
|  | c. | Difference between SEM and TEM. | CO3 | 5 |
|  | | **Compulsory**: |  |  |
| 9. | a. | Explain the basic principle, instrumentation, procedure and indexing of XRD in detail with a neat diagram. | CO1 | 10 |
|  | b. | How the composition of the materials can be intereped using XPS. | CO1 | 10 |

ALL THE BEST