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

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

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| **Sub. Code : 17PH3021** |  | **Duration :** | **3hrs** |
| **Sub. Name : MATERIALS CHARACTERIZATION** |  | **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. | Briefly describe dark field microscopy | CO1 | 4 |
| b. | Explain the instrumentation and working of Atomic Force Microscopy technique in detail | CO1 | 16 |
| (OR) | | | | |
| 2. | a. | Compare and contrast different optical microscopic techniques. | CO2 | 4 |
| b. | Explain Powder X-ray diffraction method in detail in analyzing the structure of a given sample with structure factor calculations. | CO3 | 16 |
|  |  |  |  |  |
| 3. |  | Explain the principle and instrumentation of UV-Vis-NIR spectroscopy in detail in analyzing the optical properties of a sample | CO2 | 20 |
| (OR) | | | | |
| 4. | a. | Calculate Raman Shift in cm-1 with the incident photon of a molecule of wavelength 5800 Ȧ emitting Raman lines at 3460 Ȧ. | CO3 | 4 |
|  | b. | What is XPS analysis? Discuss the principle, instrumentation and its analysis in detail. | CO3 | 16 |
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| 5. | a. | Differentiate SEM and TEM analysis methods. | CO3 | 4 |
|  | b. | Discuss in detail about the transmission electron microscopy (TEM) working principle and instrumentation. | CO3 | 16 |
| (OR) | | | | |
| 6. | a. | Describe Photoluminiscence in brief in analyzing the optical properties of a material. | CO4 | 4 |
|  | b. | Explain Electroluminescence concepts and its application in detail | CO4 | 16 |
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| 7. | a. | What are the applications and uses of thermal analysis techniques in materials aspects. | CO6 | 4 |
|  | b. | Describe in detail about determination of the weight loss and decomposition of a material using differential thermal analysis method | CO6 | 16 |
| (OR) | | | | |
| 8. | a. | Define Specific heat.5.0 g of copper was heated from 20°C to 80°C. How much energy was used to heat Cu? (Specific heat capacity of Cu is 0.092 cal/g °C) | CO6 | 4 |
|  | b. | Explain Liquid and Gas Chormotography in detail. | CO5 | 16 |
|  | |  |  |  |
|  | | **Compulsory**: |  |  |
| 9. | a. | Differentiate two probe and four probe methods | CO5 | 4 |
|  | b. | Explain the working principle and instrumentation of Vibrating Sample Magnetometer (VSM) in detail. | CO5 | 16 |