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

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

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| **Code :** | **17PH3012** | **Duration :** | **3hrs** |
| **Sub. Name :** | **SPECTROSCOPY** | **Max. marks :** | **100** |

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

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. |  | Derive the value of Nuclear Magneton using the theory behind nuclear magnetic resonance spectroscopy. | CO1 | 20 |
| (OR) | | | | |
| 2. |  | List the basic requirements of a typical NMR spectrometer and distinguish between spin lattice and spin-spin relaxations. | CO1 | 20 |
|  |  |  |  |  |
| 3. | a. | Classify the fine and hyperfine structure in ESR spectroscopy. | CO2 | 15 |
| b. | A free electron is placed in a magnetic field of strength 1.3 Tesla. Find out the resonance frequency when g = 2.0023 and Bohr magneton μB = 9.274 x 10-24 J/T. | CO2 | 5 |
| (OR) | | | | |
| 4. | a. | Draw the block diagram of simple balanced bridge ESR spectrometer and interpret the ESR signal. | CO2 | 15 |
| b. | For a hydrogen atom with an instrument operating at 9.5 GHz, the electron spin resonance is observed. If g value for electron of hydrogen atom is 2.0026, find out the value of magnetic field required for the resonance. Given, Bohr magneton μB = 9.274 x 10-24 J/T. | CO2 | 5 |
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| 5. |  | Distinguish between NMR and NQR based on working and instrumentation. | CO3 | 20 |
| (OR) | | | | |
| 6. |  | Give a detailed note on nuclear quadrupole coupling constant in case of NQR spectroscopy. | CO3 | 20 |
|  |  |  |  |  |
| 7. |  | Criticize about the recoiless emission and absorption in case of Mossbauer spectroscopy. | CO4 | 20 |
| (OR) | | | | |
| 8. | a. | Write a detailed note on type of source and absorber used in Mossbauer spectroscopy. | CO5 | 15 |
| b. | Calculate the recoil velocity and energy of the free Mossbauer nucleus 119Sn when emitting a gamma ray of frequency 5.76 x 1018 Hz. What is the Doppler shift of the gamma ray frequency to an outside observer?. Avagadro number is 6.02 x 1023 mol-1. | CO5 | 5 |
|  | |  |  |  |
|  | | **Compulsory**: |  |  |
| 9. |  | Describe the working of an instrument which produces charged ions consisting of the parent ion and ionic fragments of original molecule and sorts these ions according to their mass/charge ratio. | CO6 | 20 |