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



**UNIVERSITY**

(Karunya Institute of Technology & Sciences)

(Declared as Deemed-to-be University under Sec.3 of the UGC Act, 1956)

**End Semester Examination – April/May– 2017**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| **Code :** | **15CH3006** | **Duration :** | **3hrs** |
| **Sub. Name :** | **MOLECULAR SPECTROSCOPY** | **Max. marks :** | **100** |

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Q. No. | Sub Div. | Questions | Course  Outcome | Marks |
| 1. | a. | Derive the energy equation for the various transitions in the vibrational spectra of diatomic molecule- Harmonic oscillator | CO1 | 10 |
| b. | Explain a) overtone b) combination bands c) difference bands. | CO1 | 7 |
|  | c. | The wavelength of a radiation is 4.1μ. What is (1) wavenumber (2) frequency (3) energy of the photon in eV photon-1. | CO1 | 3 |
| (OR) | | | | |
| 2. | a. | From the following IR spectrum, identify the functional groups present in the compound. Peak details: 1455 cm-1, 2882 cm-1, 2936 cm-1, 3036 cm-1, 3329 cm-1.  C:\Users\Ananthi\Desktop\Untitled.png | CO1 | 5 |
| b. | Derive the energy equation for various transitions in the vibrational spectra of diatomic molecule- Anharmonic oscillator. | CO1 | 15 |
| 3. | a. | Differentiate IR and Raman spectroscopy. | CO1 | 5 |
|  | b. | Discuss the quantum theory of Raman effect. | CO1 | 15 |
| (OR) | | | | |
| 4. | a. | Explain the techniques and instrumentation of Raman spectroscopy. | CO1 | 12 |
|  | b. | Discuss the pure rotational raman spectra for linear and symmetric top molecules. | CO1 | 8 |
| 5. | a. | What is Zeeman effect? | CO2 | 4 |
|  | b. | Explain the principle and instrumentation of photoelectron spectroscopy. | CO2 | 10 |
|  | c. | Write short notes on Auger electron spectroscopy. | CO2 | 6 |
| (OR) | | | | |
| 6. | a. | Discuss the principle and instrumentation offlouresence spectroscopy. | CO2 | 12 |
|  | b. | Explain Jablonski diagram. | CO2 | 8 |
| 7. | a. | Discuss the factors influencing chemical shift in NMR spectroscopy. | CO2 | 12 |
|  | b. | Why TMS is used as an internal solvent in NMR spectroscopy? |  | 2 |
|  | c. | Explain NMR absorption process. | CO2 | 4 |
|  | d. | How many different types of chemically equivalent protons are present in the following compounds?  a) b) | CO2 | 2 |
| (OR) | | | | |
| 8. | a. | What is Kramer’s degeneracy? | CO2 | 3 |
|  | b. | Discuss the principle and instrumentation of ESR spectroscopy. | CO2 | 12 |
|  | c. | Explain zero field splitting. | CO2 | 5 |
|  | | **Compulsory:** |  |  |
| 9. | a. | Explain the principle and instrumentation of Massbauer spectroscopy. | CO3 | 12 |
|  | b. | Discuss the applications of Massbauer spectroscopy. | CO3 | 8 |

ALL THE BEST