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 – Nov/Dec – 2017**

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| **Code :** | **14PH2012** | **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. | a. | Find the shortest wavelength and frequency of X-ray emitted from an X-ray machine whose accelerating potential is 50,000 Volts. | CO1 | 6 |
| b. | Describe Braggs law and the Debye-Scherrer method of X-ray diffraction to find the crystal structures. | CO1 | 14 |
| (OR) | | | | |
| 2. | a. | Radiation of 41 eV photon is used to produce photoelectron spectra of Xenon. Photoelectron spectrum shows two peaks at 27.564 and 28.870 eV. Calculate the ionization potentials of Xenon. | CO1 | 6 |
| b. | Give the difference between fine structure and hyperfine structure of hydrogen atom. | CO1 | 14 |
|  |  |  |  |  |
| 3. | a. | The magnetic dipole moment of an electron in a hydrogen atom is 1.3115 x 10-23 JT-1. What is the state of the electron? (Bohr Magneton = 9.274 x 10-24 JT-1). | CO1 | 6 |
|  | b. | Explain the FTIR spectroscopy by treating the diatomic molecules as the simple harmonic oscillator. | CO1 | 14 |
| (OR) | | | | |
| 4. | a. | Evaluate the total energy, the binding energy and excitation energy of the fifth excited state of hydrogen atom. | CO1 | 6 |
|  | b. | Describe the Quantum theory of Raman Spectroscopy. | CO1 | 14 |
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| 5. | a. | When the photons of wavelength 4358 Å incident on CCl4, we get Raman lines at 4400 Å and 4419 Å. Find out Raman shift in each of them in cm-1. | CO1 | 6 |
|  | b. | Explain the different parts of Raman Spectrometer. | CO1 | 14 |
| (OR) | | | | |
| 6. | a. | Calculate the uncertainty in the excited state energy level and the width of the associated spectral line, when the molecule makes a transition between the ground state and an excited state having a lifetime of 10-3 seconds. | CO1 | 6 |
|  | b. | Compare i. Rayleigh and Raman Scattering, ii. Fluorescence and Raman Spectroscopy. | CO1 | 14 |
|  |  |  |  |  |
| 7. | a. | A spectroscopic transition involves an energy change of 3 x 10-21 J per molecule. If there are 1500 molecules in the ground state, what is the equilibrium population of the state when the temperature is 300 K. | CO1 | 6 |
|  | b. | What are the factors affecting the width and intensity of spectral lines. | CO1 | 14 |
| (OR) | | | | |
| 8. | a. | Calculate the internal magnetic field produced by the nucleus which causes the splitting of the 3p state of sodium atom. | CO1 | 6 |
|  | b. | Discuss the principle behind Resonance raman spectroscopy and its advantages. | CO1 | 14 |
|  | |  |  |  |
|  | | **Compulsory:** |  |  |
| 9. |  | Explain the Raman activity of vibrations in case of H2O and CO2 molecules. | CO1 | 20 |

ALL THE BEST