

**SEMESTER-I**  
**Paper S-1054**  
**Spectroscopic Techniques**

**Time: 3 Hrs.**

**M.M. 75 marks**

**Note: The paper will be divided into two sections.**

Section-A One question with 10 parts (short answer word limit 20) spread over whole syllabus. Each part will be of 1 mark and candidate is required to attempt all the ten parts

**Total 10 marks**

Section-B Five questions (answer not exceeding 500 words) are from each Unit with internal choice will be asked and the candidate is required to attempt all five questions. Each question will be of 13 marks

**Total 65 marks**

**Unit-I**

**.Ultraviolet and visible spectroscopy:** Electronic transition , instrumentation, shift of bands with solvents, the isolated double bond , conjugated dienes , effects of geometrical isomerism ( steric effects, effects of alkyl substitution and ring residue), exocyclic double bonds, woodward-feiser rule, effect of strain around the diene, chromophore, polyenes, UV spectra of carbonyl compounds, unsaturated aldehyde and ketones, UV spectroscopy

**Unit-II**

**Atomic absorption spectroscopy:** Principle, instrumentation and application.

**Unit-III**

**Flame Photometry:** Principle, instrumentation and application

**Photoelectron spectroscopy:** Frank-codon principle, type of electron spectroscopy, ESCA-theory, instrumentation and application, Auger emission spectroscopy- theory , instrumentation and applications.

**Unit-IV**

**IR spectroscopy:** Molecular vibrations, calculation of vibrational frequencies, instrumentation, finger print region, IR of alkanes and effect of some functional groups,

effects of hydrogen bonding, Fermi resonance, overtones, shifting of bands due to inductive and mesomeric effects, aromatic and heteroaromatic compounds, effects of ring strain , application of IR spectroscopy, brief idea of FT-IR.

### **Unit-V**

**Raman spectroscopy:** Theory, stokes and anti stokes line, Raman depolarization ratio, instrumentation, intensity of Raman peaks, applications.

**Microwave spectroscopy:** Theory, selection rules, diatomic molecules as non-rigid rotator, symmetric top molecules, P-Q-R bands, instrumentation, limitations and applications.