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Total Number of Pages: 2

M.TECH  
EIPC103

**1st Semester Regular/Back Examination – 2015-16**

**ANALYTICAL INSTRUMENTATION**

**BRANCH(S): E & I / A E & I**

**Time: 3 Hours**

**Max marks: 70**

**Q.CODE-T1186**

**Answer Question No.1 which is compulsory and any five from the rest.  
The figures in the right hand margin indicate marks.**

- Q1 Answer the following questions: (2 x 10)
- a) Write the objective of using “Analytical Instrumentation”.
  - b) What are the sources commonly used for measuring the absorption of UV and Visible radiations?
  - c) Briefly describe different types of “Specialized Atomization Techniques”.
  - d) Write the significance of “molar absorptivity”,  $\epsilon$ ?
  - e) Distinguish between Fluorescence and Phosphorescence.
  - f) What are the general requirements of a good injection technique in case of Gas Chromatography?
  - g) Define: (i) Monochromator (ii) Raster Scanning.
  - h) Write the basic principle of operation of “Scintillating Counter”.
  - i) List different types of NMR Spectroscopy used in Analytical Instrumentation.
  - j) Write the definition of the surface of a solid. Name two spectroscopic surface methods.
- Q2 a) Describe important considerations in Evaluating an Instrumental method. (5)
- b) State and derive Beer’s law. Why do we prefer to express the Beer-Lambert’s law using absorbance as a measure of the absorption rather than transmittance? (5)
- Q3 a) What is “Atomic Absorption spectrometry (AAS)”? With a neat diagram explain “Flame Atomization” technique. Write down the applications of AAS. (5)
- b) Describe the principle of Analysis and Instrumentation in IR Spectrometry. (5)
- Q4 a) What is “Raman Spectrum”? In what way “Rayleigh scattering” is different from “Raman scattering”? Briefly describe the analysis and Instrumentation in “Raman Spectrometry”. (5)
- b) What is “Mass Spectrometry”? Draw and explain the principle of operation. Write down two applications of “Mass Spectrometry”. (5)

- Q5 a) What is Chromatography? Explain classification of Chromatography. (5)  
b) What is FTMS? Draw and explain its principle of operation. Write down its applications. (5)
- Q6 a) What are the different spectroscopic surface methods? Explain the principle of Analysis and Instrumentation of X-Ray Photoelectron Spectroscopy (XPS). (5)  
b) What are the different methods of microanalysis technique? Describe construction and operation of "Electron Microprobe". (5)
- Q7 a) Explain the principle of Analysis of X-Ray Fluorescence and Diffractometric techniques. (5)  
b) Describe the phenomena of "Chemical Shift" and "Spin-Spin Splitting" in NMR spectroscopy. (5)
- Q8 Write short notes on the following **(Any Two)** (5 x 2)  
a) Plasma Emission Spectroscopy  
b) Advantages of Potentiometer over Voltmeter  
c) X-Ray : Generation and Characteristics  
d) Nuclear Radiation Detectors