B. Tech.
(SEM. VIII) EXAMINATION. 2006-07
ANALYTICAL INSTRUMENTATION

Time : 3 Hours] [Total Marks : 100

Note : Attempt all questions.

1 Attempt any four parts of the following:
   (a) Explain why the absorption spectra of molecules have absorption bands while that of atmos have sharp lines.
   (b) Describe with the help of diagram, the constructional details of interference filter and explain its working.
   (c) Which techniques are used for signal to noise (S/N) enhancement? Explain the working of any ONE of these.
   (d) What is holographic grating? Explain briefly how it is produced?
   (e) Write down the names of various mountings that are use for placing the gratings so as to work as monochromator. Explain the working of any ONE of them.
   (f) Which are the various detectors normally used in UV/VIS spectrometers. Describe the construction and working of any ONE of them.
2 Attempt any four parts of the following:

(a) Which fuels and oxidation gases are generally used for getting proper flame for AAS and FES work. Give the various fuel/oxidant premixes and their corresponding flame temperatures.

(b) Give the block diagram of a Flame Emission spectrograph and explain its working.

(c) Explain the working of a de-arc source. What is its temperature range? Which is better de-arc or ac-arc and why?

(d) What is a lamp-turret accessory? What is its use in AAS? What can be done to reduce the warming time required for these lamps, especially for multi-elemental sequential analysis in a given multi-elemental sample matrix.

(e) Explain the working of an electrodeless discharge lamp. For which kind of element this is useful.

(f) Give the list of plasma sources. Discuss the working of any ONE of these.

3 Attempt any two parts of the following:

(a) Give the block diagram of x-ray generating equipment and explain its working. Explain clearly how electronic filtering increases the output of characteristic x-rays.

(b) Give a list of various detectors used in x-ray spectrometry. Discuss the working of scintillation counter. Name at least THREE chemicals which are used as scintillators.
(c) Write down the names of various ionization method used in mass-spectrometry. Discuss the various steps through which the reagent gas and sample goes through in chemical ionization (CI-mode) process.

4 Attempt any two of the following:
(a) Give the names of various chromatography method which are used for various applications. Explain what is partition coefficient. Discuss the working of ECD detector.
(b) Discuss how the gamma ray loose energy while interacting with matter. Explain clearly the working of a proportional counter. Give the block diagram of a counting equipment using proportional counter.
(c) Write short notes on any two of the following:
   (i) Temperature programming in GLC
   (ii) Semiconductor Radiation Counter.
   (iii) Ionization chamber.

5 Attempt any two parts of the following:
(a) What is polarography? Discuss the essential instrumental requirements and working of dc and ac polarograph.
(b) Draw a block diagram of an NMR spectrometer and explain its working. Derive the Larmor Equation and briefly mention the significance of $T_1$ and $T_2$ relaxation times.
(c) Write short notes on any two of the following:

(i) Electrochemical cell

(ii) Optical Method for air-pollution monitoring.

(iii) Piezo Electric Method for air-pollution monitoring.

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