

III B.Tech I Semester Regular Examinations, November 2006

**ANALYTICAL INSTRUMENTATION
(Instrumentation & Control Engineering)**

Time: 3 hours

Max Marks: 80

**Answer any FIVE Questions
All Questions carry equal marks**

1. With necessary diagrams briefly discuss the various types of electrodes used in pH measurement. [16]
2. (a) Explain about hydrogen purity meter by using thermal conductivity method.
(b) Explain how thermal conductivity of hydrogen different from other gases. [12+4]
3. List out the various methods used to estimate nitrogen oxides, explain any one method in detail. [16]
4. Explain in detail the solvent delivery system for liquid chromatography? [16]
5. (a) Distinguish between photodiode array detector and diode array detector.
(b) Give a schematic and explain the multi-channel spectrophotometer. [8+8]
6. Briefly explain about the atomic emission and absorption spectroscopy. [16]
7. (a) Explain about the general principle of operation of a mass Spectrometer with neat diagram.
(b) With needed schematic diagram, explain about magnetic mass Spectrometer. [8+8]
8. Write short notes on:
 - (a) Gas amplification gain.
 - (b) Geiger range.
 - (c) Unit which is used to describe the value of radio activity. [6+4+6]

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1. (a) With neat schematic explain the working principle of Beckman zeromatic pH meter.
(b) Discuss the temperature compensation arrangement in direct reading type pH meter. [8+8]
2. With necessary diagrams explain the construction and working principle of silica analyzer. [16]
3. Compare and list out the merits and demerits of non-dispersive infrared analyzer over gas chromatography in carbon monoxide estimation. [16]
4. List the various applications of liquid chromatography and explain any one application in detail? [16]
5. (a) Explain briefly the principle and operation of UV/ visible spectrometer using Littrow prism.
(b) Explain how the instrument is calibrated. [8+8]
6. (a) Explain briefly about an atomic absorption Spectroscope.
(b) What are the problems of AAS? [8+8]
7. (a) What is the need of electrostatic accelerating system in mass spectrometer?
(b) Write a brief notes on ion collecting system and recording of mass spectrograph. [6+10]
8. (a) Draw the characteristics of radiation counter tube.
(b) Discuss about proportional counter range. [8+8]

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1. (a) With neat schematic explain the working principle of Beckman zeromatic pH meter.
(b) Discuss the temperature compensation arrangement in direct reading type pH meter. [8+8]
2. (a) With neat sketch explain the dissolved oxygen electrode system.
(b) With neat sketch explain the construction of hydrogen gas electrode. [8+8]
3. How co laser can be used for the measurement of nitric oxide. Give a neat block diagram and explain the operation of each block clearly. [16]
4. (a) With neat sketches, explain in detail Photo Ionization detector is used in process gas chromatography system.
(b) With neat sketches, explain with detail Electron capture detector used in process gas chromatography system. [8+8]
5. (a) Why is source modulation often employed in atomic absorption spectroscopy?
(b) Describe one particular technique of such spectroscopic analysis and explain its Operation. [8+8]
6. (a) Briefly out line the three techniques of atomization.
(b) Compare the three techniques of atomization. [8+8]
7. (a) Calculate the resonant frequency of proton with $\mu=2.7927$ nuclear magnetron and with the external magnetic field of 14092G.
(b) Explain the term chemical shift.
(c) Explain briefly relaxation process in NMR. [4+6+6]
8. Write short notes on:
(a) Factors affecting the counting of pulses.
(b) Possible radiation methods with different interaction techniques. [8+8]

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1. (a) Explain how output potential of pH electrode is related to pH value and also for H^+ ion concentration? Give equations
(b) How the potential of pH electrode changes with temperature?
(c) Mention reference electrodes for PH measurement. [8+5+3]
2. (a) With neat sketch explain the construction and controls of a general sampling system.
(b) With neat sketch explain the sampling mechanism of the automatic sampler. [10+6]
3. How co laser can be used for the measurement of nitric oxide. Give a neat block diagram and explain the operation of each block clearly. [16]
4. List the various applications of liquid chromatography and explain any one application in detail? [16]
5. (a) Explain about the advantages and Disadvantages associated with single and double beam spectrometer?
(b) What is the requirement of chopper in spectrometer. [8+8]
6. Briefly explain about the atomic emission and absorption spectroscopy. [16]
7. With neat block diagram, explain about the constructional details of NMR spectrometer. [16]
8. Explain the constructional details and principle of operation of
(a) surface barrier detector.
(b) lithium drifted germanium detector. [8+8]
