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Paper Id: 1 3 2 8 1 2 Roll No.

B TECH
(SEM VIII) THEORY EXAMINATION 2017-18
ANALYTICAL INSTRUMENTATION

Time: 3 Hours *Total Marks: 100*

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. **2 x 10 = 20**

a) What is spectroscopy? Explain its significance.
b) Define Calorimeters and explain their functionality.
c) Explain the purpose of Entrance and Exit slits.
d) Describe the function of variable path length cells.
e) Mention and explain the accessories required for flame photometer.
f) Explain the calibration curve method for determination.
g) Explain the principle of operation of a basic mass spectrometer.
h) Describe the various applications of mass spectrometry.
i) Explain the Principle of NMR
j) Describe the function of Varian T-60A NMR spectrometer.

SECTION B

2. Attempt any *three* of the following: **10 x 3 = 30**

a) Describe the operational principle of a Spectrophotometer. Draw and explain the block diagram of a Microprocessor based Spectrophotometer.
b) What are Sample Handling Techniques? State the various sampling Handling Techniques and describe micro-sampling and sampling of solids in detail.
c) Describe the principle and constructional details of flame photometer. Explain the different sources of interferences in flame photometry.
d) Describe the functions of ion cyclotron resonance (ICR) mass spectrometer & liquid chromatograph-mass spectrometer.
e) Describe the various methods for sensitivity enhancement for analytical NMR-spectroscopy.

SECTION C

3. Attempt any *one* part of the following: **10 x 1 = 10**

(a) State and describe the Beer-Lambert law relating to absorption radiation. Explain the principle of operation of an ultraviolet and visible absorption spectroscopy.

(b) What do you understand by a Double Beam spectrophotometer? Draw the Optical Diagram & Block Diagram and explain its operation.

4. Attempt any *one* part of the following: 10 x 1 = 10

(a) Describe the basic components of Infrared Spectroscopy Spectrophotometers.

(b) State the different types of Infrared Spectrophotometers. Explain the Optical Null Method of Infrared Spectrophotometer.

5. Attempt any *one* part of the following: 10 x 1 = 10

(a) State the different types of flame photometers. Explain the functional properties of a clinical flame photometer.

(b) Explain the meaning of Atomic Absorption Spectroscopy. Describe the various components of Atomic Absorption Instrumentation.

6. Attempt any *one* part of the following: 10 x 1 = 10

(a) Describe the functionality of a Radiofrequency mass spectrometer.

(b) Explain the principle of operation of inductively coupled plasma-mass spectrometer.

7. Attempt any *one* part of the following: 10 x 1 = 10

(a) Describe the constructional details of NMR spectrometer. Explain how computers can be used with NMR spectrometer

(b) Explain the differences between the continuous wave NMR spectroscopy & Fourier transform NMR spectroscopy. List also the advantages and disadvantages.