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Paper Id: 1 3 2 6 1 4 Roll No. [redacted]

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 Visible Spectroscopy? Explain its working principle and significance.
b) Explain the principle of operation of Calorimeters.
c) Explain the Sample Handling Techniques.
d) Describe the principle of Infrared Spectroscopy.
e) Mention the types of flame photometer.
f) Name the methods for determinations.
g) Explain the principle of operation of (ICR) mass-spectrometer.
h) List the applications of mass spectrometry.
i) Explain the Principle of spectrometer,
j) Describe sensitivity enhancement for analytical NMR-spectroscopy.

SECTION B

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

a) Draw the Optical Diagram & Block Diagram and explain the operation of a Double Beam spectrophotometer. Describe the operational principle of a Spectrophotometer.
b) Explain the working principle of Infrared Spectrophotometers. Explain briefly different Methods of Infrared Spectrophotometer.
c) Name the various types of flame photometers. Explain the clinical flame photometer. Describe the various accessories for flame photometer
d) Describe the working principle of tandem mass spectrometry. Explain the applications of mass spectrometry.
e) Describe the working principle of Nuclear Magnetic Resonance (NMR) Spectroscopy. Explain the various types of NMR spectrometers.

SECTION C

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

(a) Describe briefly the various laws relating to absorption radiation.

(b) Draw and explain the block diagram of a Microprocessor based Spectrophotometer. Explain the principle of operation of an ultraviolet and visible absorption spectroscopy.

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

(a) State and describe in short the various sampling Handling Techniques. Describe also some of the applications.
(b) Explain the functions of a Spectrophotometer. Describe the basic components of Infrared Spectroscopy Spectrophotometers.

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

(a) Explain the meaning of Atomic Absorption Instrumentation. Describe the various Sources of Interferences.

(b) Describe the principle and constructional details of flame photometer. Derive the expressions for concentration & interferences in flame photometry .

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

(a) Explain the various types of Mass Spectrometers. Describe the components of Mass Spectrometers. Explain the principle of operation of inductively coupled plasma-mass spectrometer.

(b) Describe the principle and the functionality of a Quadruple ion-trap mass spectrometer.

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

(a) Explain Varian T-60A NMR spectrometer. Describe the constructional details of NMR spectrometer.

(b) Explain Fourier transform NMR spectroscopy. List also the advantages and applications.