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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.