

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.