

Total number of printed pages—4

53 (IE-505) ANIN

2015

ANALYTICAL INSTRUMENTATION

Paper : IE 505

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

Answer **any 5 (five)** questions.

1. (a) With the help of a block diagram, explain the basic principle of operation of an analytical instrument. 5
- (b) Draw the block diagram of an UV-Visible spectrophotometer. Explain the functions of following components with their types and features 15
 - (i) Radiation Sources
 - (ii) Optical Filters
 - (iii) Monochromators
 - (iv) Detectors.

Contd.

2. (a) Discuss any two detectors used in IR-Spectrophotometers. 6
- (b) Describe the basic principle of atomic absorption spectroscopy with respect to the spectral lines of absorption. 6
- (c) With suitable diagrams, explain the operation of the following in atomic absorption spectroscopy 8
- (i) Plasma excitation sources
- (ii) Nebulizers.
3. (a) Describe the basic principle of mass spectrometry and explain the operation of Magnetic Deflection Mass Spectrometer. 6
- (b) Using a suitable block diagram and relevant mathematical expression, explain the basic principle and operation of Nuclear Magnetic Resonance Spectrometer. 8
- (c) Name the particles that are emitted during radioactive decay. Discuss a method for detection of radioactive particles. 6
4. (a) Describe the basic principle and working of a X-Ray spectrometer. 7

- (b) Name the components of a Gas Chromatograph. Explain each of them in brief. 8
- (c) Describe the construction and working of a Flame Ionization Detector. 5
5. (a) What is pH? Discuss the basic principle of pH measurement. 6
- (b) Describe in brief the construction and working of the following electrodes
- (i) Glass
- (ii) Calomel. 8
- (c) With the help of a diagram, explain the operation of Thermal conductivity Gas Analyzer. 6
6. (a) Explain the operation of Paramagnetic Gas Analyzer. 5
- (b) Describe in brief the methods that are commonly used for detection of *any one* of the following pollutant gases
- (i) Sulphur dioxide
- (ii) Nitrogen oxide. 8
- (c) Derive the expression for Beer-Lambert law. Discuss its significance. 7

7. (a) Write short notes on *any two*. 14

(i) Flame Photometers

(ii) FTIR Spectrophotometers

(iii) HPLC

(b) Classify the techniques used in liquid Chromatography. Explain each of them in brief. 6