

Scheme - I

Sample Question Paper

Program Name : Diploma in Instrumentation / Instrumentation & Control

Program Code : IS / IC

Semester : Fifth

Course Title : Analytical Instrumentation

Marks : 70

22543

Time: 3 Hrs.

Instructions:

- (1) All questions are compulsory.
- (2) Illustrate your answers with neat sketches wherever necessary.
- (3) Figures to the right indicate full marks.
- (4) Assume suitable data if necessary.
- (5) Preferably, write the answers in sequential order.

Q.1) Attempt any FIVE of the following.

10 Marks

- a. Write Technique used in Analytical Instrument transducer for the following properties of Analytes i) Mass ii) Mass to charge ratio.
- b. Write the use of filter in analytical instruments.
- c. List Applications of NMR spectrometer (any two).
- d. State and explain Beer Lambert law. Give its mathematical expressions.
- e. State the significance of column length on chromatogram.
- f. List gases that are used as Carrier gas for Gas chromatography.
- g. List four types of gas pollutant. Name measuring techniques for each pollutant.

Q.2) Attempt any Three of the following.

12 Marks

- a. Draw block diagram of analytical instrument. Give function of each block.
- b. Describe working principle of Infrared gas Analyzer with neat diagram.
- c. Draw a labeled block diagram of GCMS. Give two applications of GCMS.
- d. Describe working principle of Chemiluminescence for monitoring Nitrogen Oxide present in environment.

Q.3) Attempt any Three of the following.

12 Marks

- a. Explain working principle of Spectrophotometer Using Grating technique.
- b. Draw a neat block diagram of Liquid chromatography. What is the role of high-pressure pump in it?
- c. Explain working principle of Thermal Conductivity Analyzer using thermistor.
- d. Describe the working principle of Gas chromatography for monitoring Carbon monoxide present in environment.

Q.4) Attempt any Three of the following.

12 Marks

- a. Describe Interaction of radiation with matter.
- b. In chromatography, if the temperature of oven increases, what will be its effect on retention time in chromatogram?
- c. Explain the working principle of Paramagnetic Oxygen Analyzer.
- d. Describe working principle of Conductivity method for monitoring SO₂ present in environment.
- e. Describe working principle of CO Laser method for monitoring Nitrogen Oxides present in environment.

Q.5) Attempt any Two of the following.

12 Marks

- a. Explain the procedure to troubleshoot the Flame photometer.
- b. Explain principle of operation of mass spectrometer with neat diagram.
- c. Define pH. Draw constructional diagram of pH meter. List applications of pH meter. (2 points)

Q.6) Attempt any Two of the following.

12 Marks

- a. Compare Double Beam filter photometer over Single Beam filter photometer. Write applications of Colorimeter (any 3 points).
- b. Describe computation of TCO₂ and HCO₃ w.r.t. blood gas analyzer with neat circuit diagrams.
- c. Convert volumetric concentration of gas to gravimetric concentration of gas.

Scheme - I

Sample Test Paper - I

Program Name : Diploma in Instrumentation / Instrumentation & Control

Program Code : IS / IC

Semester : Fifth

Course Title : Analytical Instrumentation

Marks : 20

22543

Time: 1 Hour.

Instructions:

- (1) All questions are compulsory.
- (2) Illustrate your answers with neat sketches wherever necessary.
- (3) Figures to the right indicate full marks.
- (4) Assume suitable data if necessary.
- (5) Preferably, write the answers in sequential order.

Q.1 Attempt any FOUR.

08 Marks

- a. Categorize the given analytical instrument based on property of analyte.
- b. State Beer Lambert's Law.
- c. Define the term chemical shift with its mathematical expression.
- d. Classify chromatography
- e. List any two applications of- (i) GCMS (ii) LCMS
- f. State the working principle of liquid chromatography.

Q.2 Attempt any THREE.

12 Marks

- a. Draw block diagram of Analytical instrument & explain function of each block.
- b. State resonance condition. Describe Nuclear energy level in NMR Spectrometer.
- c. Elaborate the term "monochromator". Explain working of prism as monochromator with the help of diagram.
- d. Describe operation of discharge type Atomizer used in flame photometer with neat diagram.
- e. Draw a labelled block diagram of gas chromatography and give its working principle

Scheme - I

Sample Test Paper - II

Program Name : Diploma in Instrumentation / Instrumentation & Control

Program Code : IS / IC

Semester : Fifth

Course Title : Analytical Instrumentation

Marks : 20

22543

Time: 1 Hour.

Instructions:

- (1) All questions are compulsory.
- (2) Illustrate your answers with neat sketches wherever necessary.
- (3) Figures to the right indicate full marks.
- (4) Assume suitable data if necessary.
- (5) Preferably, write the answers in sequential order.

Q.1 Attempt any FOUR.

08 Marks

- a. Draw the schematic diagram of time of flight mass spectrometer.
- b. Convert volumetric concentration of gas to gravimetric concentration of gas.
- c. State 4 major gas pollutants along with their typical concentrations.
- d. Define pH. List the types of electrodes used for pH measurement.
- e. Draw & describe circuit diagram for computation of total CO₂ for blood gas analyzer.
- f. State the necessity of monitoring pollutants for environmental sustainability.

Q.2 Attempt any THREE.

12 Marks

- a. Describe the ozone measurement using conductivity method with the help of neat schematic diagram.
- b. Draw the neat labeled block diagram of complete blood gas analyzer.
- c. Describe the conductivity method for measurement of SO₂ in air with a neat labeled diagram.
- d. Describe the working of thermal conductivity gas analyzer with a neat schematic diagram.
- e. State the use of buffer solution in blood pH measurement