

GUJARAT TECHNOLOGICAL UNIVERSITY**BE- SEMESTER-V EXAMINATION – WINTER 2025****Subject Code:3151302****Date:21-11-2025****Subject Name:Advance Environmental Instrumentation****Time:10:30 AM TO 01:00 PM****Total Marks:70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

		MARKS
Q.1	(a) Draw a figure of electromagnetic spectrum indicating different spectral regions with wavelengths and frequencies.	03
	(b) Enlist the advance environmental instruments with its applications.	04
	(c) Derive and explain Lambert's and Beer's law.	07
Q.2	(a) Define Spectroscopy. Discuss behavior of molecules in various EMR.	03
	(b) Give the Classification of Chromatographic Methods.	04
	(c) Describe the Principle, instrumental arrangement of UV/Visible Spectroscopy in Detail with application.	07
	OR	
	(c) Enlist the types of Detectors used in Spectroscopy. Explain any one in detail.	07
Q.3	(a) Explain the following chromatographic parameters. (i)mobile phase, (ii)elution, (iii)stationary phase	03
	(b) Explain the principle of mass spectroscopy with diagram.	04
	(c) Elaborate types of chromatography, types of detectors used in it and its application.	07
	OR	
Q.3	(a) Discuss the types of column uses in Chromatography.	03
	(b) Draw a neat sketch of Standard Hydrogen Electrode and explain in detail.	04
	(c) Differentiate between UV – Visible Spectrophotometer and Atomic Absorption Spectrophotometer	07
Q.4	(a) Explain the principle of ion –exchange chromatography.	03
	(b) Draw a neat sketch of HPLC and elaborate its instrumentation.	04
	(c) Enlist and explain the different types of Ion Selective Electrode with components with neat sketch and write down application	07
	OR	
Q.4	(a) Enlist applications of TOC analyzer.	03
	(b) Differentiate the terms Turbidimetry and Nephelometry with diagrams.	04
	(c) Explain in detail sensor method for determination of dissolved oxygen	07

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| Q.5 | (a) | Highlight the applications of online sensors. | 03 |
| | (b) | Describe Conductivity Meter with analytical applications. | 04 |
| | (c) | Explain the principle, instrumentation and application of AAS. | 07 |

OR

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|------------|------------|---|-----------|
| Q.5 | (a) | Define the followings: (I) Standard deviation (II) Co-efficient of Variation (III) True Value | 03 |
| | (b) | Give the applications of AAS and AES. | 04 |
| | (c) | Enlist and explain the types of errors with at least one example of each. | 07 |

GUJARAT TECHNOLOGICAL UNIVERSITY**BE- SEMESTER-V (NEW) EXAMINATION – WINTER 2024****Subject Code:3151302****Date:02-12-2024****Subject Name:Advance Environmental Instrumentation****Time:10:30 AM TO 01:00 PM****Total Marks:70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

Marks

- Q.1**
- | | | |
|-----|--|-----------|
| (a) | Highlight the applications of instruments in various analytical field. | 03 |
| (b) | Discuss uses of Spectroscopy in Environmental Engineering. | 04 |
| (c) | Enlist types of online sensors used in the Environmental Engineering field and explain sensors used in wastewater and water field? | 07 |

- Q.2**
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|-----|---|-----------|
| (a) | What is the importance of standard methods in instrumental analysis? | 03 |
| (b) | Discuss the instrumental arrangement of AAS. | 04 |
| (c) | Enlist Advantages and Limitations of Beer's – Lambert's Law. Discuss applications of Beer's – Lambert's Law in Environmental Engineering. | 07 |

OR

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| (c) | Explain the measurement of turbidity by instrumental method with a neat sketch of the instrument. | 07 |
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- Q.3**
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|-----|---|-----------|
| (a) | Define Spectroscopy. Discuss behavior of molecules in various EMR | 03 |
| (b) | Define: Raman Spectroscopy. Describe the types of Scattering in Raman Spectrum with a neat sketch. | 04 |
| (c) | Enlist types of the Detectors used in IR Spectroscopy. Explain any one working Principle with a sketch. | 07 |

OR

- Q.3**
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|-----|--|-----------|
| (a) | Explain the interferences involved with analysis of turbidity. How to eliminate them? | 03 |
| (b) | Prepare a table depicting the types of chromatography, types of detectors used in it and its application. | 04 |
| (c) | Define: Stationary phase, Mobile phase, eluent, eluate, retention time, retention volume, Distribution coefficient k | 07 |

- Q.4**
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|-----|--|-----------|
| (a) | Explain the terms: Potentiometry, Plolarography, pH | 03 |
| (b) | Explain how TDS and conductivity are related to each other? | 04 |
| (c) | Enlist the types of detectors used in high performance liquid chromatography and explain principle of each with neat sketch. | 07 |

OR

- Q.4**
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|-----|---|-----------|
| (a) | What is chromatogram? Explain its interpretation. | 03 |
|-----|---|-----------|

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|------------|-----|--|----|
| | (b) | What is Gas chromatography? Explain its principle, components and applications. | 04 |
| | (c) | Explain the working principle of ion- selective meter, pH meter and DO meter. | 07 |
| Q.5 | (a) | Find the variance for the following data: 57, 64, 43, 67, 49, 59, 44, 47, 61,59. | 03 |
| | (b) | Explain the statistical techniques to treat data with random errors. | 04 |
| | (c) | Differentiate between BOD, COD, TOC | 07 |

OR

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| Q.5 | (a) | Find the absolute and relative errors. The actual value is 135.68 mm and the measured value is 129.66 mm. | 03 |
| | (b) | Differentiate between following i) determinant error v/s. indeterminate error ii) constant error v/s proportional error | 04 |
| | (c) | Highlight the significance of TOC. When and where should we use the TOC data/ highlight application of TOC analyzer. | 07 |

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-V (NEW) EXAMINATION – WINTER 2023****Subject Code:3151302****Date:11-12-2023****Subject Name:Advance Environmental Instrumentation****Time:10:30 AM TO 01:00 PM****Total Marks:70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

		MARKS
Q.1	(a) What is its Importance of Advanced Environmental Instrumentation?	03
	(b) List the various types of light sources used in for different types of spectrophotometer?	04
	(c) Enlist applications of various Advanced Environmental Instrumentations	07
Q.2	(a) List the various types of detector used in IR spectrometry?	03
	(b) State Beer-Lambert's law.	04
	(c) Differentiate the terms Turbidimetry and Nephelometry with proper diagrams	07
	OR	
	(c) Draw a figure of electromagnetic spectrum indicating different spectral regions with wavelengths and frequencies.	07
Q.3	(a) With suitable diagrams, discuss the various sampling techniques in Gas Chromatography.	03
	(b) With a neat diagram, explain the instrumentation setup of Atomic absorption spectrophotometer	04
	(c) With necessary diagrams, explain the working principle of HPLC. (High pressure liquid chromatography)	07
	OR	
Q.3	(a) List the types of detectors used in gas chromatography.	03
	(b) State the major process involved in AES with neat sketch.	04
	(c) With a neat sketch, explain the instrumentation set up of Mass spectrometer and its function.	07
Q.4	(a) Define conductivity with their environmental significance.	03
	(b) Elaborate with neat sketch Standard Hydrogen Electrode.	04
	(c) Explain in detail sensor method for determination of dissolved oxygen	07
	OR	
Q.4	(a) Give the significance of DO in environment.	03
	(b) What is Potentiometry? List advantages of this method in environmental analysis.	04
	(c) Enlist Ion-selective electrodes and explain any two in detail.	07

- Q.5** (a) Define: (i) True Value (ii) Variance (iii) Co-efficient of Variation **03**
(b) Discuss about statistical treatment of random errors **04**
(c) Write a short note on Frequency distribution curve. **07**

OR

- Q.5** (a) Differentiate between: Accuracy and Precision **03**
(b) Explain the term with examples (i) Standard Deviation (ii) Relative Deviation **04**
(c) State and explain types of errors in experimental data. **07**

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-V (NEW) EXAMINATION – WINTER 2022****Subject Code:3151302****Date:11-01-2023****Subject Name:Advance Environmental Instrumentation****Time:10:30 AM TO 01:00 PM****Total Marks:70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

MARKS

- Q.1**
- | | | |
|-----|---|-----------|
| (a) | Discuss the classification of spectrum in detail. | 03 |
| (b) | Give significance of 'Advanced Environmental Instrumentation' in environmental engineering field. | 04 |
| (c) | Write a short note on pH meter and its applications in Environmental Engineering field. | 07 |

- Q.2**
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|-----|---|-----------|
| (a) | a. Define the term (i) Wave number and (ii) Refractive Index
b. Calculate the energy of the photon of wavelength 600 nm. | 03 |
| (b) | Derive and explain Lambert's and Beer's law. | 04 |
| (c) | Differentiate between Visual and Instrumental method of turbidity measurement. | 07 |

OR

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|-----|---|-----------|
| (c) | Identify the types of conductivity meter electrode. Explain each type with its application. | 07 |
|-----|---|-----------|

- Q.3**
- | | | |
|-----|--|-----------|
| (a) | Explain the fundamentals principles of Spectroscopy. | 03 |
| (b) | Differentiate between UV – Visible Spectrophotometer and Atomic Absorption Spectrophotometer. | 04 |
| (c) | Enlist the types of Detectors used in Spectroscopy. Explain Flame Ionization Detector in detail. | 07 |

OR

- Q.3**
- | | | |
|-----|---|-----------|
| (a) | State the applications of TOC analyzer in environmental engineering field | 03 |
| (b) | Give the difference between adsorption and partition chromatography. | 04 |
| (c) | Explain in detail sensor method for determination of dissolved oxygen. | 07 |

- Q.4**
- | | | |
|-----|--|-----------|
| (a) | Write applications of Potentiometry. | 03 |
| (b) | Explain determinate and indeterminate error with example. | 04 |
| (c) | Explain the working principle of Infrared spectroscopy with neat sketch. | 07 |

OR

- Q.4**
- | | | |
|-----|---|-----------|
| (a) | Write down the applications of Ion selective electrode. | 03 |
| (b) | Explain the working principle of conductivity meter with neat sketch. | 04 |
| (c) | Explain the online DO meter with neat sketch. | 07 |

- Q.5**
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|-----|--|-----------|
| (a) | Explain the terms "Accuracy and Precision. | 03 |
| (b) | How total Organic carbon is measured in TOC analyzer? | 04 |
| (c) | Write a short note on importance of statistical analysis of laboratory data. | 07 |

OR

- Q.5**
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|-----|--|-----------|
| (a) | Explain the principle of Ion Chromatography. | 03 |
|-----|--|-----------|

- (b) Explain the merits and demerits of the gas chromatograph. **04**
- (c) Write a short note on High Performance Liquid chromatograph. Also draw a neat sketch. **07**
