



Name :

Roll No. :

Invigilator's Signature :

CS/B.TECH(ICE)/SEM-8/EI-801C/2012

2012

ANALYTICAL INSTRUMENTATION

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following :

10 × 1 = 10

- i) Katharometer cell is used to measure the
 - a) pH of the liquid
 - b) conductivity of the liquid
 - c) thermal conductivity of gas
 - d) potential difference.
- ii) Non-dispersive type instrument uses
 - a) wide frequency band
 - b) no restriction on frequency
 - c) narrow frequency band
 - d) single frequency.



- iii) A buffer solution is a solution that
 - a) retains its pH for a long time
 - b) cannot retain its pH for long
 - c) has no electrolytic property
 - d) acts as an intermediate solution between two solutions of different pH.
- iv) Dew point is expressed as
 - a) % (percentage)
 - b) °C
 - c) V_{ppm}
 - d) none of these.
- v) Aerosol is formed by
 - a) Bolometer
 - b) Scintillation counter
 - c) Nebulizer
 - d) Nephelometer.
- vi) Pyroelectric detector is formed by temperature sensitive
 - a) resistor
 - b) inductor
 - c) capacitor
 - d) diode.
- vii) NMR stands for
 - a) Nuclear Magnetic Resonance
 - b) Neural Membrane Response
 - c) Nuclear Magnetic Response
 - d) none of these.
- viii) In gas chromatography, capacity factor K_c can be represented as
 - a) $(t_M - t_R) / t_R$
 - b) t_R / t_M
 - c) $(t_R - t_M) / t_M$
 - d) t_M / t_R .
- ix) The mass spectrometer which uses Mattauch-Herzog geometry is
 - a) Quadrupole
 - b) ESR
 - c) Double focusing
 - d) Time of flight.
- x) In gas chromatography, stationary phase may be
 - a) plasma
 - b) liquid
 - c) gas
 - d) solid or liquid.

- In Pursuit of Knowledge and Excellence

(Short Answer Type Questions)

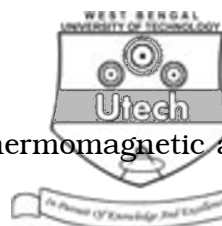
$$3 \times 5 = 15$$

- $1 + 4$

(Long Answer Type Questions)

$$3 \times 15 = 45$$

- $1 + 2$



8. a) Write down a comparison between thermomagnetic and zirconia oxygen analyzer methods. 4
- b) Discuss the difference between the dispersive and non-dispersive IR spectrometer. 4
- c) Explain the working principle of the FT IR spectrometer based on Michelson interferometer principle. 7
9. Why is analytical instrumentation system necessary in industrial process ? What do you mean by online instruments ? Describe with neat diagram, the working of thermal conductivity type gas analyzer. 4 + 3 + 8
10. a) What is meant by atomization ? Briefly discuss flame atomizer in context of atomic spectroscopy ? 1 + 5
- b) What is 'Plasma' ? Draw the schematic diagram of ICP source and briefly discuss it. 5
- c) Draw a typical scheme of atomic absorption spectroscopy. Give an example of commonly used source in atomic absorption spectroscopy. What is the basic difference between atomic absorption spectroscopy and atomic emission spectroscopy ? 2 + 1 + 1
11. Write short notes on any *three* of the following : 3 × 5
 - a) Vibrating *u* tube densitometer
 - b) Oxidation Reduction Potential (ORP)
 - c) X-ray Spectrometry
 - d) pH measurement
 - e) Time of flight type mass spectrometer
 - f) Capillary viscometer.

