	Utech
Name:	
Roll No.:	A Grant of Kambidge 2nd Explored
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:

 $10 \times 1 = 10$

- 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.

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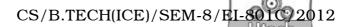


- A buffer solution is a solution that iii)
 - retains its pH for a long time
 - b) cannot retain its pH for long
 - has no electrolytic property c)
 - acts as an intermediate solution between two solutions of different pH.
- Dew point is expressed as iv)
 - % (percentage) a)
- $^{\circ}C$ b)

c) V_{ppm}

- none of these. d)
- Aerosol is formed by v)
 - Bolometer
- b) Scintillation counter
- Nebulizer c)
- Nephelometer. d)
- Pyroelectric detector is formed by temperature sensitive vi)
 - resistor
- b) inductor
- c) capacitor
- d) diode.
- vii) NMR stands for
 - Nuclear Magnetic Resonance
 - Neural Membrane Response b)
 - c) Nuclear Magnetic Response
 - d) none of these.
- viii) In gas chromatography, capacity factor K_c can be represented as
- The mass spectrometer which uses Mattauch-Herzog ix) geometry is
 - Quadrupole a)
- **ESR** b)
- Double focusing c)
- d) Time of flight.
- In gas chromatography, stationary phase may be X)
 - plasma a)
- b) liquid

c) gas d) solid or liquid.



- xi) Which of the following microwave bands is suitable for moisture measurement?
 - a) S band
- b) X band
- c) both S band & X band d) K band.

GROUP - B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

- 2. What is meant by polarization of solution in context of conductivity measurement? How can it be minimized? 2 + 3
- 3. Briefly discuss the working princple of electrolytic hygrometer with the help of schematic diagram. What is the main source of error in such hygrometer? 4 + 1
- 4. a) Define viscosity.
 - b) Explain an efflux method of viscosity measurement with a diagram. 1 + 4
- 5. How do you estimate the percentage of oxygen present in sample gas by heat of reaction method? Explain.5
- 6. What is the function of coalescer? Draw and discuss the scheme of a steam-injected suction system. 1 + 4

GROUP - C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

- 7. a) Draw a diagram of the gas chromatography setup and explain the function of the components. 3 + 4
 - b) Explain with diagram, the principle of operation of the Electron capture detector. 5
 - c) Define retain factor. Derive the expression of capacity factor. 1+2

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- 8. a) Write down a comparison between thermomagnetic and zirconia oxygen analyzer methods.
 - b) Discuss the difference between the dispersive and nondispersive IR spectrometer. 4
 - Explain the working principle of the FT IR spectrometer
 based on Michelson interferometer principle.
- 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.
 - 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.

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