	Utech
Name:	A
Roll No.:	In Spanier Williams Suige Studies
Invigilator's Signature :	

## CS / B.TECH (ICE/EIE-O) / SEM-8 / EI-801C / 2011 2011

### **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 )

l.	Choose the correct alternatives for any $ten$ of the following : $10 \times 1 = 10$						
	i)	The pH value of acidic content is					
		a)	> 7	b)	< 7		
		c)	= 7	d)	none of these.		
	ii)	i) Dew point is expressed as					
		a)	% (percentage)	b)	°C		
		c)	$V_{ m ppm}$	d)	none of these.		

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b)

d)

Scintillation counter

Nephelometer.

Aerosol is formed by

Bolometer

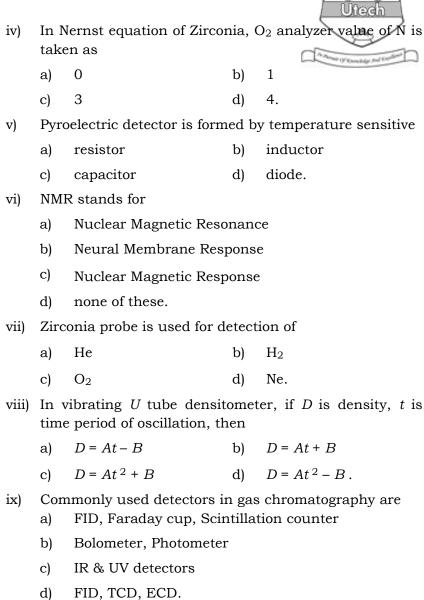
Nebulizer

iii)

a)

c)

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x)

a)

c)

air quality

water quality

b)

d)

soil quality

food quality.

Turbidity is a common criterion to measure

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- xi) In gas chromatography, stationary phase may be
  - a) plasma

b) liquid

c) gas

- d) solid or liquid.
- xii) Non-dispersive type instrument uses
  - a) wide frequency band
  - b) no restriction on frequency
  - c) narrow frequency band
  - d) single frequency.

#### **GROUP - B**

#### (Short Answer Type Questions)

Answer any three of the following.

 $3 \times 5 = 15$ 

2. What do you mean by analytical instrumentation and what is its basic differences with other instrumentation system?

2 + 3

- 3. State the basic principle of mass spectrometer.
- 4. With schematic diagram, briefly discuss the working principle of vibrating U tube densitometer.
- 5. Briefly discuss electrode-less method of conductivity measurement. Draw the schematic diagram also.
- 6. Describe the operating principle of paramagnetic type oxygen analyzer.

#### **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) Define turbidity. Define the units of turbidity. What is the basic difference between turbidimetry & nephelometry? With the help of diagram, describe the operation of LASER based nephelometer. State some applications of turbidity measurement in process industries.

  1 + 2 + 1 + 5 + 2
  - b) What are the detectors used for *uv* absorption spectrometry?
- 9. a) What are the components of a generalized sampling system ? Draw & discuss the scheme of a typical sampling probe with water separator. 1 + 4
  - b) Describe the operating principle of Searle's rotating cylinder viscometer with necessary derivation. 5
  - c) What is humister? Give a comparative study between solution resistance element & polystyrene surface resistivity cell in context of humidity measurement. 1 + 4
- 10. 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
- 11. Write short notes on any *three* of the following:  $3 \times 5$ 
  - a) IR sources
  - b) *X*-ray spectrometry
  - c) Time of flight type mass spectrometer
  - d) Emission spectrometry
  - e) Measurement of viscosity
  - f) pH measurement.

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