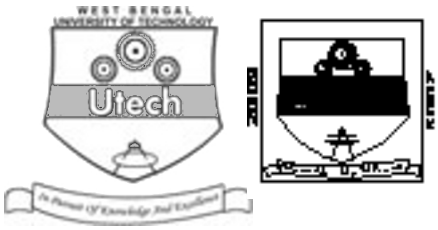
ANALYTICAL INSTRUMENTATION (SEMESTER - 8)

CS/B.TECH (ICE & EIE (O))/SEM-8/EI-801C/09



1. .....
Signature of Invigilator

2. .....
Signature of the Officer-in-Charge

Reg. No. | | | | | | | | | | | | | | |

Roll No. of the Candidate | | | | | | | | | | | | | | |

CS/B.TECH (ICE & EIE (O))/SEM-8/EI-801C/09

ENGINEERING & MANAGEMENT EXAMINATIONS, APRIL – 2009

ANALYTICAL INSTRUMENTATION (SEMESTER - 8)

Time : 3 Hours] [Full Marks : 70

INSTRUCTIONS TO THE CANDIDATES :

1. This Booklet is a Question-cum-Answer Booklet. The Booklet consists of **32 pages**. The questions of this concerned subject commence from Page No. 3.
2. a) In **Group – A**, Questions are of Multiple Choice type. You have to write the correct choice in the box provided **against each question**.
   b) For **Groups – B** & **C** you have to answer the questions in the space provided marked 'Answer Sheet'. Questions of **Group – B** are Short answer type. Questions of **Group – C** are Long answer type. Write on both sides of the paper.
3. **Fill in your Roll No. in the box** provided as in your Admit Card before answering the questions.
4. Read the instructions given inside carefully before answering.
5. You should not forget to write the corresponding question numbers while answering.
6. Do not write your name or put any special mark in the booklet that may disclose your identity, which will render you liable to disqualification. Any candidate found copying will be subject to Disciplinary Action under the relevant rules.
7. **Use of Mobile Phone and Programmable Calculator is totally prohibited in the examination hall.**
8. You should return the booklet to the invigilator at the end of the examination and should not take any page of this booklet with you outside the examination hall, **which will lead to disqualification**.
9. Rough work, if necessary is to be done in this booklet only and cross it through.

No additional sheets are to be used and no loose paper will be provided

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Marks Obtained

	Group – A										Group – B			Group – C			***Total Marks***	***Examiner's Signature***
Question Number																		
Marks Obtained																		

.....
Head-Examiner/Co-Ordinator/Scrutineer

88522 (O)-C/G (25/04)

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GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following : $10 \times 1 = 10$

i) 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.

ii) The mass spectrometer which uses Mattauch-Herzog geometry is

a) Time of flight b) Quadrupole

c) Double focusing d) NMR.

iii) In heat of combustion method, H_2 is supplies at pressure of about

a) 1·5 – 2 kg/cm^2 b) 3 – 3·5 kg/cm^2

c) 4 – 6 kg/cm^2 d) above 10 kg/cm^2 .

iv) The parameter used to measure the efficiency of a chromatographic system, is called height equivalent theoretically plates (H), which is given by

a) $H = N \times L$ b) $H = L/N$

c) $H = N/L$ d) None of these.

v) In dairy industry, which of the following units is preferred for specific gravity measurement ?

a) °Twaddell b) °Ba

c) °Quevenne d) °API. ☐

vi) Aerosol is formed by

a) Bolometer b) Scintillation Counter

c) Nebulizer d) Nephelometer. ☐

vii) In turbidimetry, the intensity of radiation after scattering depends on

a) number, size, shape of suspended particles

b) refractive indices of particles and refractive index of the medium

c) radiation wavelength

d) number, size, shape of suspended particles, refractive indices of particles, refractive index of the medium and radiation wavelength. ☐

viii) The gas used for zero adjustment of the paramagnetic oxygen analyzer is

a) helium b) hydrogen

c) nitrogen d) none of these. ☐

ix) In single focusing magnetic sector analyzer, mass to charge ratio depends on

a) magnetic field strength

b) radius of curvature

c) accelerating potential

d) magnetic field strength, radius of curvature, accelerating potential.

☐

x) 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 . ☐

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. a) Define viscosity.

   b) Explain an efflux method of viscosity measurements with a diagram. 1 + 4

3. How do you estimate the percentage of oxygen present in sample gas by heat of reaction method ? Explain. 5

4. Prove that the relation between water vapour content in air and the electrolytic current is linear in case of electrolytic hygrometer. 5

5. From two-component chromatogram, determine the expressions of capacity factor, selective factor and resolution. 5

6. What are the components of a generalized sampling system ? Draw and discuss the schematic of system that traps oil and separates water. 1 + 4

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following questions. 3 × 15 = 45

7. a) What is Beer's law of absorption ? State with assumptions.

   b) What method do you propose to use to separate the blast furnace gas which contains mainly CO, CO_2 , N_2 etc. ? Give your comments regarding its applicability.

   c) What is cell constant of a conductivity cell ? Why is it different in different cells ? 4 + 6 + 5

8. a) What is the difference between turbidimetry and nephelometry ? Define the units of turbidity. With the help of diagram, describe the operation of LASER based nephelometer. 1 + 2 + 5

b) What are the different types of mass spectrometers ? Briefly discuss any one of them. Draw the set up also. 1 + 5

c) What is the utility of mass spectrometer as detector when used in chromatography ? 1

9. a) What is humistor ?

b) Briefly describe the principle of thermal conductivity detector (TCD) and discuss the types of compounds best suited to be detected.

c) Explain the principle on which the magnetic deflection spectrometer is based.

2 + 7 + 6

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) Oxidation Reduction Potential (ORP)

b) Capillary viscometer

c) Flame Ionization Detector (FID)

d) FTIR spectroscopy.

END