53 (IE 505) ANIN

2013

(December)

ANALYTICAL INSTRUMENTATION

Paper : IE-505

Full Marks : 100

Pass Marks : 30

Time : Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1. *(a)* Fill in the blanks : 1×6=6

   (i) _____ are modification of the ion-selective electrode.

   (ii) Solid state electrodes use single crystals of inorganic material doped with _____.

(iii) X-ray tubes are normally operated at _____.

(iv) _____ is the time a compound spends in the stationary phase.

(v) The blood flowing through our veins must have a pH between _____.

(vi) _____ is the saturation temperature of the mixture at the corresponding vapour pressure.

(b) State and explain Beer-Lambert Law. 6

(c) What are the basic components of IR spectrophotometers ? Discuss briefly. 8

2. (a) Draw and explain the block diagram of a gas chromatograph system. 12

(b) What are the advantages of gas chromatography ? 4

(c) What are the important considerations, which are kept in view while designing the column oven in gas chromatography ? 4

3. *(a)* Discuss briefly the estimation technique of sulphur-di-oxide and hydrocarbons. 5+5=10

(b) List major gas pollutants and give concentration of each. 4

(c) Draw and explain labelled diagram of Calomel electrode. Also give the notation for the cell. 5+1=6

4. *(a)* Describe *any one* electrical type humidity transducer. 6

(b) What are the different types of column used in liquid chromatography ? 2

(c) Write the basic principle of NMR spectrometer. Discuss the working principle of NMR spectrophotometer. 12

5. *(a)* Define liquid chromatography. Draw a labelled block diagram of liquid chromatography system. 2+2=4

(b) What are the basic components of instrumentation for X-ray spectroscopy ? Explain briefly. 9

(c) Define radioactivity. What particles are emitted from radioactive substances ? Compare them. 2+1+4=7

6. (a) Define the following : 2×6=12

(i) Absolute humidity

(ii) Relative humidity

(iii) Phase ratio

(iv) Thermal conductivity of a gas

(v) Monochromator

(vi) Colorimeter.

(b) Describe the construction and working of a dust measuring instrument. 8

7. Write short notes on : ***(any four)*** 5×4=20

(a) Mass spectrometer

(b) GM counter

(c) Zirconia oxygen Analyser

(d) Dissolved oxygen Analyser

(e) Hydrogen Electrode.