(3 Hours) **(Total marks : 70)**

N.B.: **(1) All** questions are **compulsory**.
(2) Figures to the **right** indicate **full marks**.
(3) Answer **all sub-questions** together.
(4) Draw **neat-labeled diagrams** wherever **necessary**.

1. **A)** Answer the following **(any SEVEN)** : **7**

i. Name two excitation sources used in Atomic Emission Spectroscopy.
ii. Give the approximate wavenumbers for fundamental absorption band of nitrile and hydroxyl group.
iii. Define Absorbance
iv. Name two detectors used in IR spectrometer.
v. Name two types of filters used in colorimeter.
vi. Define the unit Becquerel used in radiochemistry.
vii. Calculate the absorbance of solution giving transmittance of 10%.
viii. Define the term absorption spectrum.

B) Answer the following **(any FOUR)** : **8**

i. Explain the terms excited singlet and excited triplet state.
ii. What is wavelength maxima? How is it determined?
iii. Fluorimetric analysis is more sensitive as compared to UV Visible spectroscopic analysis.State whether true or false. Justify your answer.
iv. What are spectral interferences in Atomic Absorption Spectroscopy?
v. What is α decay and β decay?

2. **A)** Answer the following **(any TWO)** : **8**

i. Enlist types of monochromators. With the help of suitable diagram explain working of any one monochromator.
ii. Enlist any four applications of X ray diffraction.
iii. Give four points of differences between IR and Raman spectroscopy.

B) Explain the terms radiochemical and radionucleidic purity. Name any one instrument used for measurement of radioactivity. **3**

A) Answer the following **(any TWO)** : **8**

i. What are thermal methods of analysis? With the help of an example discuss TG curve.
ii. Write a note on FTIR spectrophotometer.
iii. Differentiate between AAS and AES based on the principle involved .Give one advantage , one disadvantage and one application of AAS.

B) Enlist three sources used in IR spectroscopy. **3**

4. **A)** Answer the following **(any TWO)** : **8**

i. Derive Beer Lambert's law. Give its limitations.

ii. In a spectrophotometric assay following results were obtained. Perform linear regression to determine slope and intercept of calibration line with the data

Concentration of analyte (µg/ml)	Absorbance at λ_{max}
5	0.17
10	0.31
15	0.50
20	0.72
25	0.91

iii. In standardization of 0.1 N NaOH, burette readings obtained were as follows

Day 1	14.6	14.5	14.7	14.9	14.3
Day2	14.3	14.5	14.4	15	-

Are the mean burette readings on the two days significantly different from each other at 95% confidence level? (Tabulated 't value' is 2.365).

B) Distinguish between DSC and DTA. **3**

5. **A)** Answer the following **(any TWO)** : **8**

i. Draw an energy level diagram to describe the excitation and relaxation processes involved in fluorescence spectroscopy.

ii. Explain fundamental bands and overtones with reference to IR spectroscopy with suitable diagram. Give one pharmaceutical application of Near IR spectroscopy.

iii. Enlist methods for analysis of single component using UV-Visible spectroscopy. Discuss any one method in detail.

B) Derive Bragg's Law for X ray diffraction. **3**

6. **A)** Answer the following **(any TWO)** : **8**

i. Discuss the UV spectrophotometric method for determination of rate constant

ii. Draw block diagram of Spectroflourimeter. Explain role of each of its components in brief.

iii. Enlist reflectance methods in IR spectroscopy. Explain any one in detail.

B) Absorbance of 15 µg/ml solution of drug X (Molecular weight 204) in a 1 cm path length cell at its λ_{max} was found to be 0.76. Calculate its molar absorptivity. **3**
