

QP Code : 76280

(3 Hours)

[Total Marks : 75

- N. B. :** (1) All questions are **compulsory**.
(2) All questions carry **equal marks**.
(3) **Figures** to the **right** indicate **full marks**.
(4) Use of **logarithmic table / non-programmable calculator** is **allowed**.

1. Attempt any **five** of the following :- 15
- (a) What are Bravais lattices present in the cubic system?
 - (b) How will you determine the porosity of compound using x-ray diffraction.
 - (c) What is the effect of temperature on Mossbauer spectra of iron compounds.
 - (d) Why ESR spectra are recorded at low temperature?
 - (e) Comment on the symmetry and shape of AB_4 molecule.
 - (f) Explain "Cosine effect".
 - (g) Discuss the problems of surface analysis.
 - (h) Explain the etching process in surface analysis.
2. (a) Discuss the "lattice concept" with suitable examples. 5
- OR**
- (a) Monochromatic x-rays of wave length 162 pm are diffracted from (210 planes) of a cubic solid. If the Bragg's angle is 25° . Calculate the unit cell volume. 5
 - (b) Discuss a method to elucidate the structure of a simple gas phase molecule with the help of electron diffraction technique. 5
- OR**
- (b) State and explain Wierl equation and give its significance. 5
 - (c) Discuss the concept of magnetic scattering using neutron diffraction. 5
3. (a) Discuss the hyperfine splitting of methyl radical in ESR spectrum. 5
- OR**

- (a) Electron spin Resonance is observed for atomic hydrogen with an instrument operating at 9.5 GH. If the 'g' value for the electron in the hydrogen atom is 2.0023, what is the magnetic field applied? 5

$$(\mu_B = 9.274 \times 10^{-24} \text{ JT}^{-1})$$

$$h = 6.626 \times 10^{-34})$$

- (b) Discuss the instrumentation set up and the principle of Mossbauer Spectroscopy. 5

OR

- (b) What is Isomer shift in Mossbauer spectroscopy? Explain isomer shift for Fe and Sn compounds in different oxidation states. 5

- (c) Discuss the various conditions for good Mossbauer spectrum. 5

4. (a) Comment on the contact and pseudo contact shifts in NMR spectroscopy. 5

OR

- (a) Explain how Raman Spectroscopy is useful in the study of active sites in haemoglobin. 5

- (b) What is nuclear relaxation in NMR spectroscopy? Discuss the factors affecting the nuclear relaxation of a paramagnetic substance in solution. 5

OR

- (b) What are the characteristics of NMR spectra of ^{195}Pt compound. 5

- (c) Draw schematic diagram of typical instrument for differential thermal analysis. Discuss the principle and instrumentation for the same. 5

5. (a) Write an informative note on scanning electron microscopy (SEM). 5

OR

- (a) Discuss the characterization of inorganic compounds using NMR spectroscopy. 5

- (b) Describe the instrumentation used in Ion-Scattering Spectra (ISS) with the help of neat labelled diagram. 5

OR

- (b) Draw a neat labelled diagram and explain the instrumentation involved in 'Auger Emission Spectroscopy'. (AES) 5

- (c) Explain the principles underlying electron spectroscopy for chemical analysis. 5