NY—256—2023

FACULTY OF SCIENCE

M.Sc. (First Year) (First Semester) EXAMINATION

NOVEMBER/DECEMBER, 2023

(New/CBCS Pattern)

CHEMISTRY

Paper–IV (CH-414)

(Physical Methods in Chemistry)

(Tuesday, 12-12-2023)   **Time : 10.00 a.m. to 1.00 p.m.**

Time—3 Hours   *Maximum Marks—75*

N.B. :— (i) Attempt *all* questions.

(ii) Use of calculator and logarithm table is allowed.

1. Attempt any *three* of the following :   15

   (a) Explain inversion center and plane of symmetry operation with suitable example.

   (b) Discuss secondary storage device.

   (c) Write a difference between RAM and ROM.

   (d) Calculate Miller indices of crystal plane which cut through the crystal axes at :

   (i) $(-2a, -b, \infty\ c)$ (ii) $\left(a, -3b, \dfrac{1}{2}c\right)$

   (e) Explain conjugacy relation and classes.

   <div align="right">P.T.O.</div>

2. Attempt any *three* of the following : 15

   (*a*) Explain reducible and irreducible representation.

   (*b*) Discuss the use and advantages of flow chart in the development of computer system.

   (*c*) Calculate the angle at which second order diffraction will appear in a X-ray spectrophotometer when X-ray of wavelength 1.5 Å are used and interplanar distance is 0.04 Å.

   (*d*) Explain the use of electron diffraction study in structural study of compound.

   (*e*) Write a note on measurement technique used in neutron diffraction and give its advantages.

3. Attempt the following : 15

   (*a*) What is operating system ? Explain the WINDOWS operating system. 8

   Or

   Write programming steps for to compute rate constant of zero order reaction by equation $k = x/t$.

   (*b*) State transformation matrices for the following symmetry operations E, σ_{xz}, σ_{yz}, C_n, i. 7

   Or

   Write symmetry elements and identify point groups of molecules HCN, PCl_3, XeF_4, benzene.

4. Attempt the following :

(*a*) Explain in short, the hardware component of system. 8

Or

Derive Bragg's equation and describe Debye-Scherrer method for the structural analysis of crystal using X-ray diffraction.

(*b*) What is phase difference ? Explain structure factor and its relation to intensity and electron density. 7

Or

Give an account of scattering intensity. What would be the wavelength of an electron beam accelerated by an applied potential difference of 30 kilovolts to produce diffraction pattern.

($h = 6.626 \times 10^{-34}$ Js, mass of electron = 9.1×30^{-31} kg, charge of electron 1.6×10^{-19} C)

5. Write short notes on any *three* : 15

(*i*) Output devices

(*ii*) Abelian and non-abelian groups with a suitable example

(*iii*) Magnetic scattering

(*iv*) Schonflies symbol for different point group

(*v*) Ramachandran diagram.