This question paper contains **3** printed pages]

ST—370—2022

FACULTY OF SCIENCE

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

JUNE/JULY, 2022

(CBCS/New Pattern)

CHEMISTRY

Paper IV (CH-414)

(Physical Method in Chemistry)

(Tuesday, 5-7-2022)   **Time : 9.30 a.m. to 1.15 p.m.**

Time—3.45 Hours   *Maximum Marks—75*

N.B. :— (i) Attempt *all* questions.

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

     (iii) Figures to the right indicate full marks.

1. Solve any *three* :   15

     (a) Give an account of input devices.

     (b) Comment on the properties of a Group.

     (c) Explain Wierl equation.

     (d) Calculate the Miller indices for the planes :

         (i) (2a, b, 3c)

         (ii) (3/2a, 2b, 1c).

     (e) Discuss Laue method of X-ray structural analysis of crystals.

     (f) Write a note on DOS operating system.

2. Attempt any *three* :   15

     (a) Give the properties of Irreducible representation.

     (b) Explain the principles of programming.

P.T.O.

(c) Calculate the wavelength of electron beam accelerated by potential difference 35,000 V to produce a diffraction pattern :

$h = 6.626 \times 10^{-34}$ Js, Me $= 9.1 \times 10^{-31}$ kg

Charge of electron $= 1.6 \times 10^{-10}$ C.

(d) State the transformation matrices for the following symmetry operation :

(i) σ_{yz}

(ii) C_n

(iii) i.

(e) Give an account of scattering of neutrons by solids and liquids.

(f) Discuss secondary storage devices.

3. Answer the following :

(a) Discuss the use of Algorithm and flow chart in the development of a computer program. 8

Or

Derive Bragg's equation. Describe Debye Scherrer method for the determination of crystal structures.

(b) Explain :

(i) RAM and ROM

(ii) Computer languages. 7

Or

Give an account of Scattering intensity. What will be the wavelength of X-rays which gives a diffraction angle (θ) 8.4° for a crystal, if the inter planar distance is 4×10^{-10} m and second order diffraction is observed.

4. Answer the following :

(*a*) Explain structural features of windows operating system. Write a note on output devices. 8

Or

Derive the point group for the following molecules with illustration :

(*i*) Chlorobenzene

(*ii*) *o*-Boric acid

(*iii*) Trans-hydrazine

(*iv*) H_2O.

(*b*) Write the programming steps for Radioactive decay and van der Waals equation. 7

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

(*a*) Ramachandran diagram

(*b*) The great orthogonality theorem

(*c*) Structural features of UNIX

(*d*) X-ray structure factor and its relation to electron density.