This question paper contains **2** printed pages]

SA—10—2025

FACULTY OF SCIENCE

B.Sc. (Third Year) (Fifth Semester) EXAMINATION

MARCH/APRIL, 2025

CHEMISTRY

Paper–XIII

(Physical and Inorganic Chemistry)

(Wednesday, 9-4-2025) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

N.B. *:—* (*i*) *All* questions are compulsory.

(*ii*) Figures to the right indicate full marks.

(*iii*) Use of logarithmic tables and calculator is allowed.

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

(*i*) What are organometallic compounds ? How are they classified ?

(*ii*) Discuss structure of organolithium and ferrocene.

(*iii*) Give preparation and properties of ferrocene.

(*iv*) How is Nickel tetracarbonyl prepared ? Discuss its structure.

(*v*) Define metal carbonyl and draw the structures of $Fe_2(CO)_9$ and $CO_2(CO)_8$.

P.T.O.

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

(*a*) Write a note on association and dissociation of solute in solvent

(*b*) Discuss kinetics of consecutive reaction.

(*c*) State and explain Franck-Condon principle

(*d*) Discuss energy levels of rigid rotator in rotational spectra and show that the spectral lines are equally spaced.

(*e*) The fundamental frequency for the HCl molecule is $8.67 \times 10^{13} S^{-1}$ and its reduced mass is 1.63×10^{-27} kg. Calculate force constant of HCl molecule.

3. Answer any *two* of the following : 10

(*i*) The pure rotational spectrum of a molecule contains a series of equally spaced lines separated by 20.80 cm^{-1}. Calculate internuclear distance of molecule. ($\mu = 1.62 \times 10^{-27}$ kg).

(*ii*) Discuss rotational Raman spectra of a diatomic molecule.

(*iii*) What is third order reaction ? Give characteristics of third order reaction.

(*iv*) State Henry's law and discuss applications of distribution law.