CLASS: IMSc   SEMESTER : VI
BRANCH: CHEMISTRY   SESSION : SP/2023

SUBJECT: CH313R1 ORGANOMETALLIC CHEMISTRY

TIME: 3 Hours   FULL MARKS: 50

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

			CO	BL
Q.1(a)	Draw the Dewar Chatt Duncanson model for the bonding in Zeise's salt. Give example of the following: Dihydrogen bond, Agostic species' Classical and non classical hydrides, Kinetic & thermodynamic base	[5]	1	1
Q.1(b)	Write one reaction involved in the synthesis of Ferrocene. Draw the molecular structure of Ferrocene. Discuss the mechanism for the Fridel Craft acylation of Ferrocene	[5]	1	2
Q.2(a)	What is Collman's reagent? Discuss its synthesis and applications in organic synthesis.	[4]	2	1
Q.2(b)	Explain the structure of $Co_2(CO)_8$ and $Ni(CO)_4$ based on the Valance bond theory.	[3]	2	2
Q.2(c)	Calculate the total number of metal-metal bonds in (i) $Ru_3(CO)_{12}$ and (ii) $Co_4(CO)_{12}$ based on the 18-electron rule	[3]	2	3
Q.3(a)	Discuss metal-(1,3-Butadine) bonding based on Molecular orbital theory and discuss synergistic effect.	[4]	3	1
Q.3(b)	What is oxidative coupling? Explain the oxidative coupling in $Ir(PPh_3)_3Cl$.	[3]	3	2
Q.3(c)	Discuss the concept of umpolung in alkene upon binding with metal ions.	[3]	3	2
Q.4(a)	What are the differences between homogeneous and heterogeneous catalysis? Define Turnover number (TON) and Turnover frequency (TOF) in catalysis reactions.	[5]	4	1
Q.4(b)	Discuss catalytic cycles for the following (any two) -	[5]	4	2

Q.4(b)
   i)   Alkene hydrogenation using Wilkinson's Catalyst.
   ii) Olefin polymerization using Ziegler-Natta catalyst.
   iii) Hydroformylation of alkene using $Co_2(CO)_8$ catalyst.

| Q.5(a) | Discuss the classification and mechanism of ligand substitution reaction inbrief . The reactions of $[Ni(CO)_4]$ in which phosphines or phosphites replace CO to give $[Ni(CO)_3L]$, occur at the same rate for phospines or phosphites. Is the reaction Associative (A) or Dissociative(D)? | [5] | 5 | |
| Q.5(b) | What is trans effect . Discuss the theoris explaing trans effect. Design the synthesis of cis and trans $[PtCl_2(NO_2)(NH_3)]$- starting from $[PtCl_4]^{2-}$ | [5] | 5 | |

::::::24/04/2023::::::M