BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: IMSc **SEMESTER : VI**
BRANCH: CHEMISTRY **SESSION : SP/2024**

SUBJECT: CH313R1 INORGANIC CHEMISTRY-IV

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)	What is Collman's reagent? Discuss its synthesis and applications in organic synthesis.	[4]	1	2
Q.1(b)	Most of the organometallic carbonyl complexes undergo migrations, not insertion. How migration is different from insertion? Discuss the migration vs insertion in $CH_3Mn(CO)_5$.	[4]	1	3
Q.1(c)	What is ß-hydride elimination? Which of the following metal-alkene complex is most unstable and why? a. $Ti(C_2H_4)_4$ b. $Ti(CH_2Ph)_4$ c. $Pb(CH_3)_4$ d. $W(CH=C(CH_3)_2)_6$	[2]	1	2
Q.2(a)	Discuss metal-(1,3-Butadine) bonding based on Molecular orbital theory and discuss synergistic effect. what are the different binding modes possible in metal-alkene and metal-alkyne complexes?	[5]	2	2
Q.2(b)	Discuss the bonding of 1,4-butadiene with transition metal using the molecular orbital approach.	[3]	2	1
Q.2(c)	Why alkenes bound to metal are prone to nucleophilic attack rather than electrophilic attack?	[2]	2	1
Q.3(a)	What is oxidative coupling? Explain the oxidative coupling in $Ir(PPh_3)_3Cl$.	[4]	3	2
Q.3(b)	Discuss the oxidative addition of a) Cl_2, b) O_2, and c) methyl iodide (MeI) in Vaska's complex	[4]	3	3
Q.3(c)	What is Schlenk equilibrium?	[2]	3	1
Q.4(a)	Explain the trans effect with examples.	[5]	4	1
Q.4(b)	Discuss the mechanism of electrostatic polarization and pi bonding theory to explain the trans effect.	[5]	4	2
Q.5(a)	What are the differences between homogeneous and heterogeneous catalysis? Define Turnover number (TON) and Turnover frequency (TOF) in catalysis reactions.	[5]	5	2
Q.5(b)	Discuss catalytic cycles for the following - 1. Wacker-oxidation of alkene 2. Monsanto process for acetic acid synthesis by catalytic carbonylation of methanol	[5]	5	3

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