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

CLASS: IMSC/MSC **SEMESTER : VII/I**
BRANCH: CHEMISTRY **SESSION : MO/2023**

SUBJECT: CH401 BASIC INORGANIC 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)	Write the expression of Coulomb's integral for the energy of H_2 molecule formed from two isolated H atoms according to Valence Bond Theory.	[3]	CO1	1
Q.1(b)	Discuss the modification of ionic contribution in the covalent H-H bond in order to reduce the poor agreement of energy of H_2 molecule.	[3]	CO1	1
Q.1(c)	Draw the hybrid MO diagram of homo diatomic molecules of 2nd period elements and discuss the suitability of the MO for different elements of the 2nd period.	[4]	CO1	2
Q.2(a)	Find the Ground state Term symbol for the following: Ti^{2+}, Cr^{3+} .	[4]	CO2	2
Q.2(b)	$Ni(en)_3$ is easily formed , but not $Cu(en)_3$ - Explain by crystal field theory.	[4]	CO2	2
Q.2(c)	Write the expression of $V_{oct.}$ at any point in space, mentioning the terms involved.	[2]	CO2	1
Q.3(a)	Explain π-bonding theory of trans effect. How will you prepare cis and trans $[Pt(NH_3)Cl_2]$ staring from $[PtCl_4]^{-2}$.	[5]	CO3	2
Q.3(b)	Discuss the outer sphere and inner sphere mechanism of electron transfer reactions. Why is the electron transfer in the system $[Co(NH_3)_6]^{+2}$ - $[Co(NH_3)_6]^{+3}$ slower than that in the system $[Fe(CN)_6]^{-4}$ - $[Fe(CN)_6]^{-3}$.	[5]	CO3	3
Q.4(a)	Identify the Symmetry Point Group of the following: trans $Co(NH_3)_4Cl_2$.	[2]	CO4	2
Q.4(b)	Predict the double structured electronic spectrum of $CuCl_3$. 6 H_2O.	[4]	CO4	2
Q.4(c)	For the octahedral complexes of Ni^{+2} with glycine, ammonia, ethylenediamine, bipyridyl and phenanthroline how the intensity of spin allowed and spin forbidden transition vary. In this context highlight the phenomenon of Intensity Stealing.	[4]	CO4	3
Q.5(a)	In the electronic spectra of $[Cr(H_2O)_6]^{2+}$, along with the sharp peak at 14,000 cm^{-1}. one shoulder is obtained at 15,000 cm^{-1} – Interpret the spectrum with the electronic transition in ORGEL Diagram	[5]	CO5	2
Q.5(b)	Explain the difference in the spectrum of cis- and trans- $Co(en)_2F_2$ in terms of holohedrized symmetry.	[5]	CO5	2

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