CLASS: MSC/IMSC   SEMESTER : II/VIII
BRANCH: CHEMISTRY   SESSION : SP/22

SUBJECT: CH408 ADVANCED INORGANIC CHEMISTRY

TIME: 2.00 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

1. a) What are the two sources of paramagnetism. Derive the expression of orbital magnetic moment.   4

   b) Mention the factors affecting the spin -orbit coupling constant in a metal ion. Calculate the spin-orbit coupling constant of Ni^{2+} in $Ni(H_2O)_4Cl_2$, if the spin-orbit coupling constant of Ni^{2+} is $630cm^{-1}$.   6

2. a) Show how the barry centre rule and degeneracy is maintained for d^2 electronic configuration.   5

   b) Explain why Sm^{3+} and Eu^{3+} are exceptional from the rest of the lanthanides in terms of magnetic property.   5

3. a) Explain why the observed magnetic moment of Co-salen complex is higher than spin only value.   4
   b) Discuss the origin of subnormal magnetic moment of $[Cu(OAc)_2.H_2O]_2$.   6

4 (a) Derive the all-possible STYX code for B_5H_9. Also indicate the possible acceptable STYX codes.   4

   b) Predict the total valance electron count (TVE) and the total number of atoms (n) upon condensation of polyhedral units (according to Mingo's rule) for any two of the following-   Also, draw the structure of the initial and final Polyhedral   6

  i. Tetrahedral and open-triangle via edge-sharing
  ii. Tetrahedral and closed-triangle via vertex-sharing
  iii. Octahedral and tetrahedral via face-sharing

5. a) Consider the following molecules. Calculate the total valance electron count (TVE), polyhedral electron count (PEC) and assign each one as *closo*, *nido*, *arachno* or *hypo*. -Any two   6

  i. $Ru_5C(CO)_{16}$
  ii. $[Ni(CO)_{12}]^{2-}$
  iii. $B_9H_{14}^-$
  iv. $C_2B_4H_6$

   b) Determine the unknown quantity with a suitable explanation- Any two   4
  i. $[(\eta^5 -Cp)W(CO)_x]_2$ (has a W-W single bond) determine x.
  ii. $[(CO)_3Ni-Co(CO)_3]^z$ determine z.
  iii. $[(\eta^5 -Cp)Mn(CO)_x]_2$ (has a Mn=Mn double bond) determine x.
  iv. $[(\eta^5 -Cp)M(CO)_3]_2$ (has a single M-M bond) determine M if it belongs to 1st-row transition metal.

25/4/2022 E