COURSE CODE: CHM 423.
COURSE TITLE: COORDINAATON CHEMISTRY
COURSE UNIT: 2
INSTRUCTION: Answer question one (1) and any other three questions
Time: 3 Hours

QUESTION 1 (25 marks)
  A) How many orbitals are involved in the formation of the following hybrid orbitals
    i) Sp , ii) sp^2 , iii) sp^3 , iv) d^2sp^3 , v) sp^3d^2 (5 marks)
  B)   Write the IUPAC name of the following complexes.   (6 marks)
    i) $K_2[Ni(CN)_4]$
    ii) $[Cu(NH_3)_6Cl_3$
    iii) $[Co(NH_3)_5Cl]Cl_2$
  C) State the coordination numbers and valences of the metals in each of the following-
    complexes.   (4 marks)
      i) $[Ni(CO)_4]$, and
      ii) $[Fe((CN)_4]^{3-}$
  D)   Describe the phenomena; Intra-ligand transition.   (10 marks),

QUESTION 2. (15 marks)
A)   A solution of cobalt complex with empirical formula of $CoCl_3.6NH_3$ gave three moles of
        chloride ions on treatment with $AgNO_3$ solution. Derive the molecular formula of the
        complex and state the reason for your answer.   (5 marks)
B) Explain the term Diamagnetism in transition metal complexes.   (10 marks)

QUESTION 3. (15 marks)
Highlight the various applications of coordination compounds   (5 marks)
B)   Explain the differences between Orgel diagram and Tanabe-Sugano diagram   (10 marks)

QUESTION 4. (15 marks)
A) Briefly explain the valence bond theory and its limitations.   (5 marks)
B) Describe briefly the geometry of Coordination number 4.   (10 marks)

QUESTION 5. (15 marks)
The electronic spectral of $[Ti(H_2O)_6]^{3+}$ gave as single band at 20,300 cm^{-1}, account for this observation.
                                                                (15 marks)

QUESTION 6. (15 marks)
 A) Define the following terms   (4 marks)
      i) Coordination compound
      ii) Ligand
B) Give the formula of the following complexes.   (6 marks)
      i) Potasium hexathiocyanatoferrate(II)
      ii) Bis(Oxalato)nickelate(II)
      iii) Potassiumdicyanato aurate(I)
C) At 300 K, the observed value of μeff for $[V(NH_3)_5]Cl_2$ is 3.9 BM, show that it agrees with that obtain
by the spin only formula   (5 marks)