Autumn Mid-Semester Examination-2015
1st Semester B.Tech & B.Tech Dual Degree
Chemistry (CH-1003)

Full Mark: 25   Time: 2 Hours

(Answer any five questions including Question No. 1 which is compulsory)

The figures in the margin indicate full marks

All parts of a question should be answered at one place only

1. (a) Among H_2^+ and H_2^- molecular ions which one is more stable and why?   [1x5]

   (b) K_2CrO_4 is intensely colored. Explain.

   (c) Extrinsic semi-conductors have more conductivity value than intrinsic semi-conductors. Explain

   (d) Justify that nearly all tetrahedral complexes are high spin.

   (e) Find the magnetic moment of $[Co\ (NH_3)_6]^{3+}$ complex ion.

2. (a) What do you mean by LCAO. Show the shapes of molecular orbitals formed by the linear combinations of '2p' orbitals.   [2x2.5]

   (b) B_2 molecule is stable where as Be_2 molecule is unstable.

3. Explain the following: [2x2.5]

   (a) Magnesium is good conductor of electricity in spite of completely filled valence band.

   (b) NO is paramagnetic while NO^+ is diamagnetic.

4. (a) Explain $[Ni\ (H_2O)_6]^{2+}$ is green but $[Ni(CN)_6]^{2-}$ is colorless.   [2x2.5]

   (b) Assign the colors green and blue to the complexes: $[Cu\ (H_2O)_6]^{2+}$ and $[Fe(H_2O)_6]^{2+}$.

5. (a) Δ_0 for $[Fe(H_2O)_6]^{2+}$ is found to be 21,000 cm^{-1} from electronic spectrum. If average pairing energy of Fe (II) is 28,000 cm^{-1}, calculate its CFSE value.   [2x2.5]

   (b) Draw the crystal field splitting diagram with distribution of d-electrons for the complex ion $[Fe\ (NO)(H_2O)_5]^{2+}$. Also calculate its magnetic moment due to spin only.

6. $[Ni\ Cl_4]^{2-}$ is paramagnetic while $[Ni\ (CN)_4]^{2-}$ is diamagnetic. Deduce the geometry of both the complexes. Also calculate μ_{spin} on the basis of CFT.   [5]

7. (a) When excess of ammonia is added to copper sulphate solution, a deep blue colored complex is formed. Predict the geometry of the complex on the basis of VBT.   [2x2.5]

   (b) $[Co\ (NH_3)_6]^{3+}$ ion is more stable than $[Co\ (NH_3)_6]^{2+}$ ion. Explain on the basis of CFT.