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

CLASS: IMSC **SEMESTER : V**
BRANCH: CHEMISTRY **SESSION : MO/19**

SUBJECT: IMC5007 INORGANIC CHEMISTRY - I

TIME: 3 HOURS **FULL MARKS: 60**

INSTRUCTIONS:
1. The question paper contains 7 questions each of 12 marks and total 84 marks.
2. Candidates may attempt any 5 questions maximum of 60 marks.
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.

Q.1(a) What are the main conditions which Ψ must satisfy to give meaningful solutions (Eigen functions)? [2]
Q.1(b) Give the relationship between Cartesian coordinates and polar coordinates. Explain angular and radial wave function. [4]
Q.1(c) Draw and explain the shapes of d- orbitals. [6]

Q.2(a) Show the possible orientation of orbital vector of d- electron. (l = 2) [2]
Q.2(b) Calculate the no. of microstate in the following configuration; [4]
(i) d^1(ii) p^2(iii) p^3
Q.2(c) Differentiate between R-S coupling & j-j coupling. Derive all the term symbols for p^2 configuration. [6]

Q.3(a) What do you understand by magnetic moment and magnetic susceptibility? [2]
Q.3(b) Deduce a formula for calculating the magnetic moment of transition metal complexes. [4]
Q.3(c) Discuss the following property of transition element: (i) Catalytical properties (ii) formation of interstitial compounds. [6]

Q.4(a) What is electrode potential? [2]
Q.4(b) Discuss redox stability of water with the help of graph. [4]
Q.4(c) (i) Construct the Frost diagram from the following Latimer diagram [6]

$$Tl^{3+} \xrightarrow{+1.26V} Tl^{+} \xrightarrow{-0.34\ V} Tl^{o}$$

(ii) Predict the stability or instability of Tl^+
(iii) Which of these species is strong oxidizing agent

Q.5(a) Differentiate between disproportionation and comproportionation reaction. [2]
Q.5(b) What do you understand by Pourbaix diagram? Discuss the stability of various oxidation state of iron with the help of Pourbaix diagram. [4]
Q.5(c) Draw Latimer diagram for the following reduction half-ractions and calculate the value of E^o for the reduction of Cu^{+2} to Cu. [6]
$Cu^{+2} + e^- \rightarrow Cu^+$, $E^o = +0.15$ V ⟶
$Cu^+ + e^-$ ⟶ Cu^o, $E^o = +0.50$ V

Q.6(a) What are nonaqueous solvents? Discuss their classifications. [2]
Q.6(b) Discuss the properties of liquid ammonia. Give the following chemical reactions taking place in it. (i)Precipitation reactions, (ii) Redox reactions. [4]
Q.6(c) What do you understand by SCF? Explain diagrammatically with the help of one example. [6]

Q.7(a) What is magic acid? [2]
Q.7(b) Discuss the following reactions in liquid HF. (i) Precipitation reaction (ii) redox reaction. [4]
Q.7(c) Write notes on (i) Fluorosulphonic acid (ii) Molten salt [6]

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