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

CLASS: BTECH
BRANCH: AI&ML/CS/EC/EE

SEMESTER: I
SESSION: MO/2022

SUBJECT: CH101 CHEMISTRY

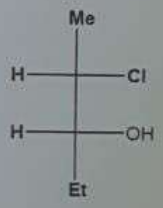
TIME: 2 HOURS

FULL MARKS: 25

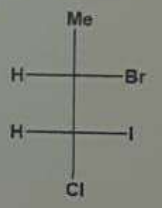
INSTRUCTIONS:
1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates.

			CO	BL
Q.1(a)	Explain the normal spinel structure for Mn_3O_4 and inverse spinel structure for Fe_3O_4.	[2]	1	Understand
Q.1(b)	Explain hybridization, shape and magnetic behaviour of the following complexes: $[NiCl_4]^{2-}$, $[Ni(CO)_4]$, $[Ni(CN)_4]^{2-}$.	[3]	1	Understand
Q.2(a)	Taking the example of Cu(II) d^9 system explain the phenomenon of Z-in and Z-out.	[2]	1	Understand
Q.2(b)	Show by means of a diagram, and a simple calculation, the minimum value of the radius ratio r+/r- which permits a salt to adopt a cesium chloride type of structure.	[3]	1	Interpreting
Q.3(a)	Discuss the formation of bonding and antibonding molecular orbitals with the applications of linear combination of atomic orbitals (LCAO) method.	[2]	2	Applying
Q.3(b)	Find out the bond order and magnetism of O_2^+ O_2^{2-} N_2^- and N_2^{2+}?	[3]	2	Applying
Q.4(a)	Predict whether cyclopentadiene anion is aromatic or not?	[2]	2	Understand
Q.4(b)	Find out the R, S nomenclature of the following compounds.	[3]	2	Applying

(i)



(ii)



Q.5(a)	Discuss the collision theory of reaction rate along with its limitations.	[2]	3	Understand
Q.5(b)	For a given first order reaction rate constant, k is 2.6×10^{-10} s^{-1} at 300 °C and 6.7×10^{-4} s^{-1} at 500 °C. Calculate the energy of activation. [R = 8.3 $J.K^{-1}.mol^{-1}$]	[3]	3	Understand

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