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HL-003-010302 Seat No. _____

M. Sc. (Sem. III) (CBCS) Examination

May / June – 2017

Inorganic Chemistry

(C(I)-302 : Symmetry and Group Theory)

Faculty Code : 003
Subject Code : 010302

Time : $2\frac{1}{2}$ Hours] [Total Marks : **70**

Instructions :

(1) All questions are compulsory.

(2) All questions carry equal marks.

1 Answer the following : (any seven) **14**

(a) Give the point group of given molecule.

(A) Cr(Co)6 (B) Ferrocene

(C) Cis-$PtCl_2Br_2$ (D) Benzene

(b) Explain Center of Symmetry.

(c) Explain the use of identity operation in Molecular Symmetry.

(d) Give the example of following point group :

(A) C_s (B) D_{3h}

(C) T_d (D) C_{4v}

(e) Discuss addition of Matrices with suitable example.

(f) Explain horizontal plane σ_h.

(g) Explain molecules which are highly symmetric.

(h) Give Reduction formula to find out the number irreducible representation.

(i) Give some important properties of the group.

2 Answer the following : (any two) **14**

(a) Construct the character table for C_{3v} point group.

(b) Explain different types of matrices.

(c) Using character table find out the number of irreducible representation (Γ_R) for C_{3v} point group.

$\Gamma_\sigma = 4 \quad 1 \quad 0$

3 Answer the following : (any two) **14**

(a) Find out the number of vibrations in $POCl_3$ using character table and predict the Geometry and Hybridization using character table :

C_{3v}			
Γ_{3N}	15	0	3

(b) Obtain matrix representation of symmetry elements present in Water molecule.

(c) Using sine formula show that 'F' term splits in to A_{2u}, T_{1u} and T_{2u} in Octahedral field.

4 Answer the following : **14**

(a) Find out the number of IR and Raman active bands in XeO_4 using character table :

C_{4v}					
Γ_{3N}	18	2	–2	4	2

(b) Explain the method to determine point group of any molecule.

5 Answer the following : **14**

(a) Derive Sine formula for splitting of orbital or energy levels in different symmetries.

OR

5 Answer the following : **14**

(a) Write note on Great Orthogonality theorem.