

Seat No. : \_\_\_\_\_

**DA-113**

**December-2018**

**M.Sc., Sem.-I**

**401 : Chemistry  
(Inorganic Chemistry)**

**Time : 2 :30 Hours]**

**[Max. Marks : 70**

1. (A) State four postulates of quantum mechanics. Explain two of them. **14**

**OR**

- (i) Calculate the first order correction term for the Eigen function by using perturbation method. **7**
- (ii) Explain the application of variation method on H atom. **7**
- (B) Answer in **one** or **two** lines (any **four** out of six) : **4**
  - (i) Using commutator relationship, prove the Heissenberg's uncertainty principle.
  - (ii) Define Hermitian operator.
  - (iii) Why is  $\sin^{-1} x$  not a well behaved wave function in the interval  $(-1, 1)$  ?
  - (iv) Give expressions for Ladder Operators.
  - (v) What does the results from the variation method mainly depend on ?
  - (vi) Give the expression for perturbation.

2. (A) State Great Orthogonality Theorem. Give its five important rules about irreducible representations by taking the example of  $C_{3V}$  point group. **14**

**OR**

- (i) Show that  $p_x$  and  $p_y$  orbitals of nitrogen atom in ammonia, described by the following eigen function  $p_x = R \sin \theta \cos \phi$ ;  $p_y = R \sin \theta \sin \phi$ ; provide a basis of the irreducible representation E. **7**
- (ii) Give an example of symmetric matrix with explanation. **7**
- (B) Answer in **one** or **two** lines (any **four** out of six) : **4**
  - (i) Give an example of diagonal matrix.
  - (ii) What is Kronecker delta ?
  - (iii) In area III of the character table, what do understand when function x and y are written as  $(R_x, R_y)$  and not as  $R_x, R_y$  representation ?
  - (iv) When are the two matrices conformable for multiplication ?
  - (v) What is significance of direct product ?
  - (vi) An energy integral  $\int \Psi_i H \Psi_i dt$ , may be non-zero only if.. ...

3. (A) Discuss the basic terms of Magneto-chemistry. 14

**OR**

- (i) Write a note on paramagnetism. 7  
 (ii) Discuss in detail antiferromagnetism. 7  
 (B) Answer in **one** or **two** lines (any **three** out of Five). 3  
 (i) Calculate the  $\chi_{\text{dia}}$  for Copper(II) acetate hydrate.  
 (ii) What is Larmor precession ?  
 (iii) What is Meissner effect ?  
 (iv) Give the equation for spin-only formula.  
 (v) Write the definition for Neel temperature.

4. (A) Write a detailed note on Vitamin B12 and Zinc metalloenzymes. 14

**OR**

- (i) Give the full name of Cis-DDP and discuss its discovery, synthesis and mode of action. 7  
 (ii) Write a note on Antibacterial agents. 7  
 (B) Answer in **one** or **two** lines (any **three** out of five) : 3  
 (i) Define the term Bio-inorganic chemistry.  
 (ii) What is T conformational state in Hb ?  
 (iii) Write the advantages of MRI.  
 (iv) Write the biological function of Chromium.  
 (v) What is Bohr effect ?

**Character Table :**

$C_{3v}$	E	$2C_3$	$3\sigma_v$		
$A_1$	1	1	1	z	$x^2 + y^2, z^2$
$A_2$	1	1	-1	$R_z$	
E	2	-1	0	$(x, y) (R_x, R_y)$	$(x^2 - y^2, 2xy) (xz, yz)$