Reg.No. \_\_\_\_\_\_\_\_\_\_\_\_



**UNIVERSITY**

(Karunya Institute of Technology & Sciences)

(Declared as Deemed-to-be University under Sec.3 of the UGC Act, 1956)

**End Semester Examination – April / May – 2017**

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| **Code :** | **15CH3007** | **Duration :** | **3hrs** |
| **Sub. Name :** | **CHEMICAL THERMODYNAMICS AND ELECTROCHEMISTRY** | **Max. marks :** | **100** |

**ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | Marks |
| 1. | a. | Write a note on internal energy. Describe its relationship with work and heat. | CO1 | 5 |
| b. | What is the work done on the system, if one mole of an ideal gas at 300 K is expanded isothermally and reversibly to one fourth of its initial volume? Calculate the change in entropy of this process. | CO1 | 5 |
| c. | Prove that CP-CV = [P + (δE/δV)T] (δV/δT)P | CO1 | 10 |
| (OR) | | | | |
| 2. | a. | Show that (δS/δV)T = (δP/δT)V | CO1 | 4 |
| b. | Prove that CP-CV = [V- (δH/δP)T] (δP/δT)V | CO1 | 8 |
| c. | Show that (δE/δV)T = [T(δP/δT)V – P] | CO1 | 8 |
| 3. | a. | Derive the Gibbs-Helmholtz equation. | CO1 | 7 |
|  | b. | What is fugacity? How one can determine the fugacity of a gas? | CO1 | 10 |
|  | c. | Show that (δSV/δP)T = - (δV/δT)P | CO1 | 3 |
| (OR) | | | | |
| 4. | a. | Explain the four strokes of Carnot cycle with a neat sketch. | CO1 | 12 |
|  | b. | What is activity? Derive its relationship with Gibbs free energy. | CO1 | 5 |
|  | c. | Show that (δU/δS)V = (δH/δS)P | CO1 | 3 |
| 5. | a. | What is Nernst heat theorem? How to determine the absolute entropies of solid, liquids and gases? | CO1 | 10 |
|  | b. | Derive the vibrational partition function for a system consists of “N” particles. | CO1 | 10 |
| (OR) | | | | |
| 6. | a. | Derive the Maxwell-Boltzmann (M-B) statistics for a system consists of “N” particles. | CO1 | 10 |
|  | b. | Describe the following thermodynamic parameters in terms of molecular partition functions. i) Helmholtz function (A), ii) Enthalpy (H) and iii) Gibbs function (G) | CO1 | 10 |
| 7. | a. | Derive the Einstein theory of heat capacity of solids. | CO1 | 10 |
|  | b. | Describe the following thermodynamic parameters in terms of molecular partition functions. i) Internal Energy (U), ii) Entropy (S) and iii) Pressure (P) | CO1 | 10 |
| (OR) | | | | |
| 8. | a. | Derive the rotational partition function for a system consists of “N” particles | CO1 | 10 |
|  | b. | Derive the Sackur-Tetrode equation. | CO1 | 10 |
|  | | **Compulsory:** |  |  |
| 9. | a. | Explain the various double layer theory in detail. | CO1 | 10 |
|  | b. | What is streaming potential? Derive its expression. | CO1 | 10 |