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 – Nov/Dec – 2016**

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|  |  | **Semester :** | **2016-17 ODD** |
| **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. | What is Joule-Thomson effect? Derive its coefficient. | CO1 | 10 |
| b. | Prove that CP-CV = [P + (δE/δV)T] (δV/δT)P | CO1 | 10 |
| (OR) | | | | |
| 2. | a. | What is the work done on the system, if one mole of an ideal gas at 300 K is compressed isothermally and reversibly to one fifth of its initial volume? Calculate the change in entropy of this process. | 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. | Derive the expression for chemical potential in a system of ideal gases | CO1 | 10 |
|  | c. | Show that (δV/δS)P = (δT/δP)S | CO1 | 3 |
| (OR) | | | | |
| 4. | a. | Explain the four strokes of Carnot cycle with a neat sketch | CO1 | 12 |
|  | b. | Derive the equation for the entropy of mixture of ideal gases | CO1 | 8 |
| 5. | a. | Derive the Maxwell-Boltzmann (M-B) statistics for a system consists of “N” particles. | CO1 | 10 |
|  | b. | Find out the value of β for M-B statistics. | CO1 | 10 |
| (OR) | | | | |
| 6. | a. | Derive the Bose-Einstein statistics for a system consists of “N” particles. | 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 |
| 7. | a. | Derive the Sackur-Tetrode equation | CO1 | 10 |
|  | b. | Derive the translation partition function for a system consists of “N” particles | CO1 | 10 |
| (OR) | | | | |
| 8. | a. | Derive the Debye theory of heat capacity of solids | CO1 | 15 |
|  | b. | Describe the following thermodynamic parameters in terms of molecular partition functions. i) Helmholtz function (A) and ii) Enthalpy (H) | CO1 | 5 |
|  | | **Compulsory:** |  |  |
| 9. | a. | Verify the Onsager reciprocal relationship. | CO1 | 12 |
|  | b. | Explain Stern theory of double layer in detail. | CO1 | 8 |

ALL THE BEST