**9. THERMODYNAMICS RELATIONS**

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| **MATHEMATICAL THEOREMS** | |
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| **PROPERTIES** | | | |
| **GIBB’S FUNCTION** | | **HELMHOLTZ FUNCTION** | |
| Open System Availability Function. | | Closed System Availability Function. | |
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| **COEFFICIENT OF VOLUME EXPANSIVITY** | | **ISOTHERMAL COMPRESSIBILITY** | |
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| **MAXWELL’S EQUATIONS** | |
| **Derived from 1st TdS Equation,** | **Derived from 2nd TdS Equation,** |
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|  | From, Above mentioned Equations,  3rd and 4th Maxwell’s equation. |
|  | Equating above , |
|  | From the maths theorem, |
|  | Equating above , |
|  | From the maths theorem, |
|  | From |

|  |  |
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|  | From definition of . |

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| **INTERNAL ENERGY EQUATION:** It’s valid for Real & ideal Gas. | From Mayer’s equation, equation (1) and 1st TdS Equation.  **For ideal Gas,** |
| **ENTHALPY EQUATION:** It’s valid for Real & ideal Gas. | From Mayer’s equation, equation (2) and 2nd TdS Equation.  **For ideal Gas,** |
| **JOULE-THOMSON COEFFICIENT EQUATION:** It’s valid for Real & ideal Gas. | From Enthalpy equation, & for Throttling process  **For ideal Gas,** |