Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

III SEMESTER B.TECH. (CHEMICAL ENGINEERING)

MAKEUP EXAMINATIONS, DEC 2017

SUBJECT: CHEMICAL ENGINEERING THERMODYNAMICS-I [CHE 2104]

REVISED CREDIT SYSTEM

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitable assumed.

1A.	Explain briefly the following with examples: (i) stable and unstable equilibrium (ii) closed system and isolated system (iii) reversible and free expansion (iv) heat engine and heat pump	**06**
1B.	Calculate the volume of ethylene vapour at 8.25 MPa and 25^{o}C using the van der Waals equation of state. Use the iterative procedure. The values of critical temperature and critical pressure are 283.1 K and 51.17 bar respectively.	**04**
2A.	Derive the expression for first law of thermodynamics for a flow process.	**05**
2B.	Explain the principle of corresponding states with respect to two parameter and three parameter correlation.	**02**
2C.	State and prove, Carnot principle first postulate with the help of simplified diagrams.	**03**
3A.	An ideal gas undergoes the following reversible processes: (a) From an initial state of 343 K and 1 bar it is compressed adiabatically to 423 K (b) It is then cooled to 343 K at constant pressure (c) Finally, it is expanded to its original state isothermally. Calculate ΔU, ΔH, W and Q for each step. Assume $C_v = (3/2)R$	**05**
3B.	Explain the variation of molar volume of a substance with pressure at different temperature.	**05**
4A.	Discuss Virial equation of state in terms of both pressure and volume.	**01**
4B.	With the help of Mnemonic diagrams, explain the rules for getting Maxwell's relations.	**04**
4C.	Derive the modified expressions for entropy in terms of coefficient of expansion, coefficient of compressibility and heat capacity.	**05**
5A.	Heat is considered as less versatile form of energy compared to work. Discuss.	**02**
5B.	List out any four properties of refrigerant.	**02**
5C.	Discuss with a neat flow diagram, the Regenerative cycle of steam power plant. Also discuss the TS diagram.	**06**