Code No: RT21033 **R13** SET - 1

II B. Tech I Semester Supplementary Examinations, Oct/Nov - 2017
THERMODYNAMICS
(Com. to ME, AE, AME)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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PART –A

1.	a)	In practice reversible process is not possible explain why?	(3M)
	b)	What is a steady flow process?	(3M)
	c)	State the limitations of first law of thermodynamics.	(4M)
	d)	Why do the isobars on Mollier diagram diverge from one another?	(4M)
	e)	Why do the specific heats of an ideal gas depend only on the atomic structure of the gas?	(4M)
	f)	What are the four basic components of a steam power plant?	(4M)

PART -B

2.	a)	Show that internal energy is a property of the system.	(8M)
	b)	Calculate the amount of heat required to convert 100 kg of ice at -10^0C into steam at 100^0C at normal pressure. Specific heat capacity of ice=2100 J/Kg K, latent heat of fusion of ice =3.36 x 10^5 J/Kg, specific heat capacity of water =4.2 kg K/kg-K and latent heat of vaporization of water = 2.25 x10^6 J/kg.	(8M)
3.	a)	Write the steady flow energy equation for a single stream entering and a single stream leaving a control volume and explain the various terms in it.	(8M)
	b)	What is Vander wall`s equation of state? What is the significance of the various constants involved in the equation?	(8M)
4.	a)	Define Claussius inequality and prove it.	(7M)
	b)	An inventor reports that he has developed an engine that operates between the temperature limits of 80^0C and -17^0C. During the process the engine absorbs 23 x 10^3 kJ/h of heat and develops 2 kW of power. Show with reason how far his claim is justified.	(9M)
5.	a)	Explain the principle of operation of a throttling calorimeter.	(6M)
	b)	A vessel of volume 1 m^3 capacity contains steam at 20 bar and 0.85 dryness fraction. Steam is blown off until the pressure drops to 10 bar. The valve is then closed. Determine the mass of steam blown off. Assume the process as throttling.	(10M)
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6. a) Express the changes in internal energy and enthalpy of an ideal gas in a reversible adiabatic process in terms of the pressure ratio. (8M)
   b) Atmospheric air at 1 bar and is at 25^0C DBT and 15^0C WBT. Calculate (i) relative humidity (ii) specific humidity (iii) vapour density in air (iv) DPT (v) enthalpy of mixture. (8M)

7. a) For the same compression ratio and heat rejection, which cycle is most efficient: Otto, Diesel or Dual? Explain with $p - v$ *and* $T - s$ diagrams. (6M)
   b) In an air standard Diesel cycle, the compression ratio is 16, and at the beginning of isentropic compression, the temperature is 15^0C and the pressure is 0.1 M Pa. Heat is added until the temperature at the end of the constant pressure process is 1480^0C. Calculate (i) the cut-off ratio, (ii) the heat supplied per kg of air, (iii) the cycle efficiency and (iv) the m.e.p. (10M)