Code No RT21033 **R13** SET - 1

II B. Tech I Semester Supplementary Examinations, April /May - 2016
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) What are the requirements of a standard scale of temperature (4M)
   b) What do you mean by free expansion process (4M)
   c) What are the limitations of the first law of thermodynamics (4M)
   d) At critical temperature of water is water a two phase mixture (3M)
   e) What is meant by adiabatic saturation (3M)
   f) What do you mean by air standard cycle? (4M)

PART -B

2. A Platinum resistance thermometer has a resistance of 12.78 ohm in ice.17.77 ohm in steam and 25.67 ohm when placed in a furnace. Calculate the fundamental interval of the thermometer and the platinum resistance temperature of the furnace. If the difference between the gas scale temperature and the temperature measured by the above thermometer at the boiling point of the sulphur (445^0C) was 23^0C, Calculate the gas scale temperature of the furnace (16M)

3. a) Derive an expression for the First Law of thermodynamics applied to a closed system. (8M)
   b) The volume of receiver, containing a gas whose specific heats at constant pressure and constant volume are 0.238 and 0.169 kJ/kg K respectively is 0.566 m^3. The temperature and pressure in the receiver are 20^0C and 3.5 bar, respectively. Calculate the pressure when 0.91 kg of gas been pumped out. (8M)

4. a) Derive absolute temperature scale from Carnot principle (6M)
   b) In a certain process, a vapor while condensing at 430^0C transfers heat to water at 250^0C.The resulting steam is used in a power cycle which rejects heat at 40^0C.What fraction of the available energy in the heat transferred from the process vapor at 430^0C is lost due to irreversible heat transfer to water at 250^0C (10M)

5. a) Discuss the generation of steam at constant pressure. Show the various processes on temperature-enthalpy diagram (8M)
   b) 15000 kg of water and 15 kg of dry saturated steam at 10 bar are contained in the boiler drum. Determine the total heat content and the internal volume of the boiler. When the pressure in the boiler is 2 bar calculate the mass of steam and water .Also, calculate the temperature of the water in the boiler (8M)
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6. a) Distinguish clearly between the terms of dry bulb temperature, dew point temperature, wet bulb temperature and adiabatic saturation temperature as used in psychrometry (8M)
   b) Water at the rate of 25000 liters per hour enters a cooling tower where it is cooled from 70^0C to 34^0C.Atmospheric air at 36^0 C and 25 percent RH is available for the cooling purposes. Assuming the air leaves the cooling tower saturated with water vapor at 34^0C,determine the rate of air leaving the cooling water and make up water per hour (8M)

7. a) Show that the efficiency of Stirling cycle is equal to that of the Carnot cycle (8M)
   b) An air standard Diesel cycle operates with a compression ratio is 14.8 and a cut-off ratio 2.At the beginning of the compression the air pressure and the temperature are 37.8^0C and 1 bar respectively. Calculate (a) the maximum temperature in the cycle and the heat input per cycle (8M)