Enrollment No:-_____   Exam Seat No:-_____

C.U.SHAH UNIVERSITY
Summer-2015

Subject Code: 4TE03TDY1   **Subject Name: Thermodynamics**
Course Name: B.Tech (Mech)   Date: 7/5/2015
Semester:III   Marks: 70
                                        Time:02:30 TO 05:30

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Instructions:
1) Attempt all Questions of both sections in same answer book/Supplementary.
2) Use of Programmable calculator & any other electronic instrument prohibited.
3) Instructions written on main answer book are strictly to be obeyed.
4) Draw neat diagrams & figures (if necessary) at right places.
5) Assume suitable & perfect data if needed.

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SECTION – I

Q – 1   a   Distinguish between homogeneous and heterogeneous system.   02
        b   Explain perpetual motion machine of the first kind – PPM 1.   02
        c   Write the steady flow energy equation for thermally insulated nozzle. 02
        d   Write the statement of Zeroth law of thermo dynamics.   01

Q – 2   a   Explain quasi-static system with p-V diagram.   05
        b   Water enters in a boiler at specific enthalpy of 400 kJ/kg and boiler and boiler   05
            is produced steam with specific enthalpy 2790 kJ/kg. Heat added by burning
            of fuel is 2500 kJ/kg. The entry point is 5m below the exit point. Assume the
            KE= 0. Calculate the heat loss from boiler through radiation to the
            surrounding.
        c   Prove that entropy is a property of a system.   04

OR

Q – 2   a   Explain triple point with diagram in detail   05
        b   A reversible heat engine operates between high and low temperature limit of   05
            1200 and 300 K respectively. The whole output utilized to operates a heat
            pump from heat engine. The pump operates on reversed Carnot cycle and
            extracts heat from a reservoir at 250 K and delivers it to the reservoir at 300 K.
            If 140 kJ/s of net heat is supplied to the reservoir at 300 K, calculate the heat
            supplied by the reservoir at 1400 K.
        c   Explain Point function and Path function.   04

Q -3   a   State and prove the Clausius theorem.   05
        b   Write the limitation of the first law of thermodynamics with example. 05
        c   Derive COP for reversed heat engine or Carnot heat pump.   04

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<center>OR</center>

Q -3	a	Prove the equivalence of Clausius and Kelvin statements.	05
	b	Prove that all reversible engines working between the two constant temperature reservoirs have the same efficiency.	05
	c	State and explain third law of thermodynamics.	04

<center>**SECTION – II**</center>

Q – 4	a	Why is the Carnot cycle not practicable for steam power plant?	02
	b	State the function of Orsat apparatus.	02
	c	Define Dead State.	02
	d	What is air- fuel ratio?	01

Q – 5	a	State and explain Gibbs-Dalton law.	05
	b	Explain Construction and working of Bomb calorimeter with neat sketch.	05
	c	In an Otto cycle the temperature at the beginning and end of the isentropic compression are 423 K and 690 K respectively. Determine the air standard efficiency and compression ratio.	04

<center>OR</center>

Q – 5	a	Write a short note on Van der Waal's equation.	05
	b	Define the following (i) Enthalpy of Formation (ii) Enthalpy of reaction	05
	c	A fuel has the following composition by mass: Carbon= 85%, Hydrogen= 12.75% and Oxygen= 22.5%. Determine the stoichiometric air required per kg of fuel and the mass of products of combustion per kg of fuel.	04

Q -6	a	Explain adiabatic mixing of perfect gases.	05
	b	Derive an expression for irreversibility of closed system.	05
	c	Explain why it is said that Entropy of the Universe is constantly increasing? Justify.	04

<center>OR</center>

Q -6	a	Explain the Rankine cycle on P-V and T-S diagram.	05
	b	Write comparison of first and second law of thermodynamics.	05
	c	Explain and write different equation of effectiveness or second law of efficiency.	04

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