Enrollment No: _____ **Exam Seat No:_____**

C. U. SHAH UNIVERSITY

Summer Examination-2018

Subject Name: Thermodynamics

Subject Code: 4TE04TDY1 **Branch: B.Tech (Automobile)**

Semester: 4 **Date: 08/05/2018** **Time: 10:30 To 01:30** **Marks: 70**

Instructions:

(1) Use of Programmable calculator & any other electronic instrument is prohibited.
(2) Instructions written on main answer book are strictly to be obeyed.
(3) Draw neat diagrams and figures (if necessary) at right places.
(4) Assume suitable data if needed.

Q-1 **Attempt the following questions:** **(14)**

(a)	Write the statement of second law of thermo dynamics.	**(1)**
(b)	What is pressure ratio?	**(1)**
(c)	Why is the Carnot cycle not practicable for steam power plant?	**(1)**
(d)	Write the definition of Heat.	**(1)**
(e)	Define Extensive properties.	**(1)**
(f)	Write the definition of flow process.	**(1)**
(g)	Which law states that heat and work mutual converted?	**(1)**
(h)	What is thermal energy reservoir (TER)?	**(1)**
(i)	What the meaning of word "Enthalpy "?	**(1)**
(j)	What is dead state?	**(1)**
(k)	What is thermal equilibrium?	**(1)**
(l)	Define a pure substance.	**(1)**
(m)	Define excess air.	**(1)**
(n)	What is the COP of refrigerator?	**(1)**

Attempt any four questions from Q-2 to Q-8

Q-2 **Attempt all questions** **(14)**

(a)	Explain microscopic and macroscopic point of view.	**(03)**
(b)	Explain quasi-static system with p-V diagram.	**(04)**
(c)	A reversible heat engine operates between high and low temperature limit of 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.	**(07)**

Q-3 **Attempt all questions** **(14)**

(a)	Derive the equation W = m (h1 – h2) - Q for reciprocating compressor.	**(04)**
(b)	Define control volume. What is the difference between system and control volume?	**(04)**

	(c)	Explain perpetual motion machine of the second kind – PPM 2.	**(04)**
Q-4		**Attempt all questions**	**(14)**
	(a)	Write comparison of Otto, Diesel and dual cycle.	**(07)**
	(b)	An air standard Otto cycle has a compression ratio of 8. At the start of the compression process the temperature is 26° C and the pressure is 1 bar. If the max. temperature of the cycle is 1080° C. Calculate: (a) The heat supplied per kg of air. (b) The thermal efficiency of the cycle.	**(07)**
Q-5		**Attempt all questions**	**(14)**
	(a)	Explain the effect of the following on the efficiency of Rankine cycle. (i) Superheating steam, (ii) Turbine inlet Pressure, (iii) condenser pressure.	**(06)**
	(b)	Write a short note on Van der Waal's equation.	**(06)**
	(c)	Prove that ΔE = Constant for isolated system.	**(02)**
Q-6		**Attempt all questions**	**(14)**
	(a)	Explain Construction and working of Junker's Gas calorimeter with neat sketch.	**(07)**
	(b)	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)**
	(c)	Write comparison of first and second law of thermodynamics.	**(03)**
Q-7		**Attempt all questions**	**(14)**
	(a)	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.	**(06)**
	(b)	Explain adiabatic mixing of perfect gases.	**(06)**
	(c)	Define (i) HCV (ii) LCV	**(02)**
Q-8		**Attempt all questions**	**(14)**
	(a)	Explain briefly Brayton cycle. Derive expression for optimum pressure ratio.	**(08)**
	(b)	Write a short note on Adiabatic flame temperature.	**(06)**