Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV(New) EXAMINATION – SUMMER 2016

Subject Code:2143406 **Date:26/05/2016**

Subject Name:Thermo Dynamics and Thermal Eng.

Time:10:30 AM to 01:00 PM **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

			MARKS
Q.1		**Short Questions**	**14**
	1	Define the term High grade energy.	
	2	Explain the term Low grade energy.	
	3	What is available energy?	
	4	What is meant by unavailability?	
	5	What is a steady flow process?	
	6	What are the causes of irreversibility of a process?	
	7	Explain the term reversibility	
	8	Explain the term irreversibility.	
	9	What do you understand by Ideal gas?	
	10	Describe the term isobaric process.	
	11	Define the term adiabatic process.	
	12	What do you understand by pure substance?	
	13	Explain the term internal energy.	
	14	Define the term enthalpy.	
Q.2	**(a)**	Distinguish between the terms ‘change of state’, ‘path’ and ‘process’.	**03**
	(b)	Explain the different types of thermodynamic systems.	**04**
	(c)	Define the specific heat at constant pressure and constant volume. Show that for an ideal gas, Cp – Cv = R.	**07**
		OR	
	(c)	Explain the phase change processes for pure substances.	**07**
Q.3	**(a)**	Explain what you understand by thermal equilibrium.	**03**
	(b)	Explain the Second law of thermodynamics with examples.	**04**
	(c)	Explain briefly the Diesel cycle with the help of P-V diagram and derive the expression for the ideal efficiency of Diesel cycle.	**07**
		OR	
Q.3	**(a)**	What is the difference between work transfer and heat transfer?	**03**
	(b)	Show that work and heat both are the path function and not a property.	**04**
	(c)	A fluid at 200 kPa and 300 ºC has a volume of 0.8 m^3. In a frictionless process at constant volume the pressure changes to100 kPa. Find the final temperature and the heat transferred. If fluid is air.	**07**
Q.4	**(a)**	What is Joule-Thomson coefficient? What is it zero for an ideal gas?	**03**
	(b)	Show that in a diffusion process at constant temperature the entropy increases and Gibbs function decreases.	**04**
	(c)	Derive Maxwell’s equations.	**07**

OR

Q.4	**(a)**	What are the intensive and extensive properties? Explain in detail.	**03**
	(b)	Explain the zeroth law of thermodynamics with example.	**04**
	(c)	If γ is the ratio of specific heats of perfect gas, derive the relation PV^{γ} = Constant. When a perfect gas is expanded adiabatically.	**07**
Q.5	**(a)**	Explain the modes of heat transfer with examples.	**03**
	(b)	Derive the expression for maximum non expansion work for isobaric process.	**04**
	(c)	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.	**07**

OR

Q.5	**(a)**	Give the expression for reversible work done by a closed system if it interacts only with the surroundings.	**03**
	(b)	What are Helmholtz and Gibbs function?	**04**
	(c)	In a certain process, a vapour while condensing at 420 ºC, transfers heat to water evaporating at 250 ºC. The resulting steam is used in a power cycle which rejects heat at 35 ºC. What is the faction of the available energy in the heat transferred from the process vapour at 420 ºC that is lost due to the irreversible heat transfer at 250 ºC?	**07**

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