Reg.No. _____

Karunya UNIVERSITY

(Karunya Institute of Technology & Sciences)
(Declared as Deemed-to-be University under Sec.3 of the UGC Act, 1956)

End Semester Examination – Nov/Dec – 2016

Semester : 2016-17 ODD
Code : 14ME2014 **Duration : 3hrs**
Sub. Name : Engineering Thermodynamics (Batch 8) **Max. marks : 100**

ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)

Q. No.	Sub Div.	Questions	Course Outcome	Marks
1.	a.	How does internal energy, enthalpy relates to each other?	CO1	1
	b.	Describe 2nd law of TD?	CO2	1
	c.	Explain 1st law of TD for a closed system undergoing a change in state.	CO1	2
	d.	Write down the steady flow Energy Equation (SFEE).	CO1	2
	e.	The properties of a closed system change following the relation between pressure and volume as $pV = 3.0$, where p is in bar V is in m^3. Calculate the work done when the pressure increases from 1.5 bar to 7.5 bar. Given 1 bar = 10^5 N/m^2.	CO1	14
		(OR)		
2.	a.	What is the main cause of the irreversibility?	CO1	1
	b.	What are known as Intensive properties?	CO1	1
	c.	Explain a PMM1 engine.	CO1	2
	d.	If the source and sink temperatures are T1,T2, respectively, calculate the efficiency of heat pump and a heat engine	CO1	2
	e.	Heat leaks into a refrigerator at a rate of 1200 Jule/s. To maintain 7°C internal temperature against 25°C atmosphere, how much power will be required? What is the COP of the refrigerator?	CO1	14
3.	a.	What is unavailable energy in a Carnot cycle?	CO1	1
	b.	When do you refer a thermodynamic system as reversible?	CO1	1
	c.	Explain Kelvin-Planck's law, which kind of engine can violate this law?	CO1	2
	d.	How the "heat pump" and "heat engine" are different?	CO1	2
	e.	Air at 20°C and 1.05 bar occupies 0.025 m^3. The air is heated at constant volume until the pressure is 4.5 bar, and then cooled at constant pressure to original temp. Calculate the net entropy change. Given c_v= 0.718 and c_p=1.005 kJ/kg K	CO1	14
		(OR)		
4.	a.	What is the entropy change in adabatic process?	CO2	1
	b.	Is entropy change between two state is path dependent?	CO2	1
	c.	How a reversible path can be replaced with reversible adiabatic – isothermal - adiabatic steps combination?	CO2	2
	d.	Explain Clausius inequality statement.		2
	e.	One kg of water at 0°C is brought into contact with a heat reservoir at 90°C. When the water has reached 90°C, find : (i) Entropy change of water ; (ii) Entropy change of the heat reservoir, given cp=4.187kJ/kg K.	CO2	14
5.	a.	What is critical temperature of water-vapour phase diagram?	CO2	1
	b.	What are the liquid side and steam side saturation points?	CO2	1
	c.	Find Entropy, enthalpy of steam at 1Mpa 325°C.	CO2	2
	d.	Draw a schematic T-S diagram when water is converted to superheated steam.	CO2	2
	e.	Find entropy, enthalpy, dryness fraction for a water-steam mixture having specific volume 0.15 m^3/kg at 1 Mpa.	CO2	14

		(OR)		
6.	a.	How does the saturation temp changes with system pressure?	CO3	**1**
	b.	What is triple point data?	CO3	**1**
	c.	How will generate Mollier diagram (H-S plot)	CO3	**2**
	d.	What is superheated steam and what is compressed water?	CO3	**2**
	e.	What amount of heat would be required to produce 1 kg of steam at a pressure of 0.6 MPa and temperature of 250°C from water at 30°C? Take specific heat for superheated steam as 2.2 kJ/kg K, and water 4.18 kJ/kg K	CO3	**14**
7.	a.	Write down relationship between "pv" and "p" in power series form?	CO3	**1**
	b.	How does van der Wall's Equation of state takes care about non-ideality?	CO3	**1**
	c.	Define specific heats, i.e. c_p and c_v for and ideal gas.	CO3	**2**
	d.	Derive the value for universal gas constant (in SI unit) from the information that 1 gmol gas volume is 22.4 L at STP.	CO3	**2**
	e.	1 kg of air at 0.8 MPa and a temperature of 100°C undergoes a reversible polytropic process following the law pv^2 = constant. If the final pressure is 0.18 MPa. Determine the final specific volume, temperature.	CO3	**14**
		(OR)		
8.	a.	Define partial pressure of a gas in mixture	CO3	**1**
	b.	What is adiabatic mixing of ideal gases?	CO3	**1**
	c.	How does the apparent gas constant relates with universal gas constant?	CO3	**2**
	d.	Calculate apparent molecular weight of air assuming 23% O_2 and 77% N_2	CO3	**2**
	e.	A vessel of 0.35 m3 capacity contains 0.4 kg of carbon monoxide (molecular weight = 28) and 1 kg of air at 20°C. Calculate : (i) The partial pressure of each constituent, (ii) The total pressure in the vessel.	CO3	**14**
		Compulsory:		
9.	a.	What is due point temperature and wet bulb temperatures?	CO4	**1**
	b.	Differentiate between specific and relative humidity.	CO4	**1**
	c.	Deduce the coorelation between specific humidity and partial pressure of water vapour.	CO4	**2**
	d.	If specific humidity of atmospheric air at 20°C is 0.0095 kg/kg of dry air, calculate partial pressure of water vapor.	CO4	**2**
	e.	In the same problem above, calculate relative humidity, and dew point temperature.	CO4	**14**

ALL THE BEST

Students are allowed to use the steam-table they have in their possession