

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

Code : 14ME2014
Sub. Name : Engineering Thermodynamics

Semester : 2016-17 ODD
Duration : 3hrs
Max. marks : 100

Q. No.	Questions				Course outcome	Marks
PART-A (40X1=40 MULTIPLE CHOICE QUESTIONS)						
1.	Macroscopic approach of thermodynamics is also known as				CO1	
	a. Applied thermodynamics	b. Statistical thermodynamics	c. Large scale thermodynamics	d. Classical thermodynamics		(1)
2.	property does not depend on the amount of matter present is called				CO1	
	a. Extensive property	b. Thermodynamic property	c. Intensive property	d. Inclusive property		(1)
3.	Any change that a system undergoes from one equilibrium state to another is called a				CO1	
	a. Change over	b. Process	c. Energy transfer	d. cycle		(1)
4.	Isothermal process is a				CO1	
	a. Constant pressure process	b. Constant volume process	c. Constant temperature process	d. Constant mass process		(1)
5.	The SI unit of Energy is				CO1	
	a. N/m ²	b. Nm ²	c. Nm	d. N/m		(1)
6.	When there are no unbalanced forces within a system or with its surrounding, the system is said to be in				CO1	
	a. Chemical Equilibrium	b. Thermodynamic Equilibrium	c. Thermal Equilibrium	d. Mechanical Equilibrium		(1)
7.	The measurement of a thermodynamic property known as temperature is based on				CO1	
	a. Second law of thermodynamics	b. Zeroth law of thermodynamics	c. First law of thermodynamics	d. none of these		(1)
8.	Kelvin-Planck's law deals with				CO2	
	a. conservation of work	b. conversion of heat into work	c. conservation of heat	d. conversion of work into heat		(1)
9.	The gas constant (R) is equal to the _____ of two specific heats.				CO2	
	a. ratio	b. sum	c. product	d. difference		(1)
10.	For a constant pressure process heat transfer is equal to				CO2	
	a. Change in internal energy	b. Work done	c. Change in enthalpy	d. Change in entropy		(1)
11.	An adiabatic process is the one in which				CO2	
	a. There is no change in internal energy	b. no heat enters or leaves the gas	c. Heat enters or leaves the gas	d. none of the above		(1)
12.	The change in internal energy is equal to work done in				CO2	
	a. isothermal process	b. isochoric process	c. isobaric process	d. adiabatic process		(1)
13.	At triple point of water ----- will be in equilibrium				CO3	
	a. Three phases	b. Two phases	c. single phase	d. none		(1)

14.	At phase change				CO3	
	a. T and P are constant	b. P and V are constant	c. T and S are constant	d. T and V are constant		(1)
15.	Difference between super heat temperature and saturation temperature is				CO3	
	a. Degree of super heat	b. Degree of saturation	c. Degree of sublimation	d. none		(1)
16.	The specific volume of wet steam will ----- than the dry steam				CO3	
	a. equal	b. less	c. greater	d. none		(1)
17.	The difference between h_g and h_f in steam table is called -----				CO3	
	a. Latent heat of vaporization	b. Latent heat of sublimation	c. Latent heat of melting	d. Latent heat of fusion		(1)
18.	The meeting point of saturated liquid line and saturated vapor line is				CO3	
	a. Subcritical point	b. Triple point	c. Critical point	d. none		(1)
19.	Real gas will show ideal behavior at				CO1	
	a. Low temperature	b. High temperature	c. Critical temperature	d. saturation temperature		(1)
20.	Throttling process is				CO3	
	a. isenthalpic	b. isentropic	c. isobaric	d. isochoric		(1)
21.	There is a machine which would continuously supply mechanical work without some other form of energy disappearing simultaneously				CO1	
	a. True	b. False	c. May be true or False	d. Sometimes true		(1)
22.	The energy required to raise the temperature of a unit mass of a substance by one degree				CO1	
	a. Melting point	b. Triple point energy	c. Specific heat capacity	d. Boiling capacity		(1)
23.	Intermolecular bonds are strongest in _____ and weakest in _____				CO2	
	a. Solids and gases	b. Gases and liquids	c. Gases and solids	d. Solids and liquids		(1)
24.	Compressed liquid or a subcooled liquid means : that the liquid is				CO3	
	a. About to evaporate	b. In superheated state	c. Not about to evaporate	d. In solid state		(1)
25.	_____ is the line where all the three states of a pure substance exists in equilibrium				CO3	
	a. Saturation point line	b. Critical point line	c. Triple point line	d. Phase line		(1)
26.	The process of transformation of a pure substance from solid to Vapour when heated is known as				CO3	
	a. Transformation	b. Vaporization	c. Condensation	d. Sublimation		(1)
27.	Inside the vapour dome, water exists as				CO3	
	a. Liquid + Vapour	b. Pure vapour	c. Pure Liquid	d. Super heated vapour		(1)
28.	Fusion curve, Vaporization curve and sublimation curves meet at the				CO3	
	a. Saturation point	b. Critical point	c. Triple point	d. Phase line		(1)
29.	What are standard temperature and pressure conditions for gases				CO1	
	a. 0°C and 0 torr	b. 0 K and 760 torr	c. -273°C and 1atm	d. 0°C and 760 torr		(1)

30.	Avogadro stated that equal volumes of gases under the same conditions of temperature and pressure have equal				CO2	
	a. numbers of molecules	b. numbers of grams	c. molar masses	d. atoms		(1)
31.	Gas pressure is mainly caused by				CO2	
	a. Gas molecules heating up	b. Gas molecules reacting with other gas molecules	c. Gas molecules hitting the walls of a container	d. Gas molecules hitting other gas molecules		(1)
32.	For a gas, which pair of variables are inversely proportional to each other (if all other conditions remain constant)?				CO2	
	a. P, T	b. P, V	c. V, T	d. n, V		(1)
33.	What is the formula for number of kg moles (n) of a gas? If, m = mass of gas in kg μ = molecular weight in kg / kg mole				CO4	
	a. $n = m \cdot \mu$	b. $n = m / \mu$	c. $n = \mu / m$	d. none of the above		(1)
34.	If the volume of a confined gas is doubled while the temperature remains constant, what change (if any) would be observed in the pressure?				CO4	
	a. It would be half as large	b. It would double	c. It would be four times as large	d. It would be 1/4 as large		(1)
35.	The deviation from ideal-gas behavior can accurately be accounted for by the introduction of a correction factor called as				CO4	
	a. Compressibility factor	b. Reduction factor	c. Critical factor	d. Correlation factor		(1)
36.	The ratio of mass of water vapor in a given volume of air at given temperature T to mass of water vapor when the same volume of air is saturated at temperature T is known as				CO4	
	a. Humidity ratio	b. Degree of saturation	c. Specific Humidity	d. Relative Humidity		(1)
37.	Wet Bulb Depression is the difference between				CO4	
	a. DBT and DPT	b. DBT and WBT	c. DPT and WBT	d. RH and DBT		(1)
38.	The ratio of actual specific humidity and the saturated specific humidity, both at same temperature is known as				CO4	
	a. Humidity ratio	b. Degree of saturation	c. Specific Humidity	d. Relative Humidity		(1)
39.	Substances that have great affinity to water vapour are known as				CO4	
	a. Humidifiers	b. absorbents	c. adsorbents	d. Smart substances		(1)
40.	In a adiabatic evaporative cooling process				CO4	
	a. DBT increased and Humidity decreased	b. DBT Lowered and Humidity decreased	c. DBT increased and Humidity increased	d. DBT Lowered and Humidity increased		(1)

PART B(8 X 5 = 40 MARKS) (ANSWER ANY EIGHT)

41.	State first law for a closed system undergoing a change of state? Show that Energy is a property of a system?	CO1	(5)
42.	A cyclic heat engine operates between a source temperature of 800 °C and a sink temperature of 30 °C. What is the least rate of heat rejection per kW net output of the engine?	CO2	(5)
43.	Air undergoes two processes: Process 1-2 expansio from $P_1 = 300$ kPa, $v_1 = 0.019$ m ³ /kg to $P_2 = 150$ kPa during which the p-v relation is given by $pv = \text{constant}$. Process 2-3 is constant pressure compression to $v_3 = v_1$. Sketch the processes on a p-v diagram and determine the workdone per unit mass.	CO1	(5)

44.	Explain the operation of a cyclic refrigerator plant with a block diagram.	CO2	(5)
45.	Steam initially at 1.5 MPa, 300 °C expands reversibly and adiabatically in a steam turbine to 40 °C. Determine the ideal work output of the turbine per kg of steam.	CO3	(5)
46.	What is pure substance? Draw the phase equilibrium diagram for a pure substance on T-s plot with relevant constant property lines.	CO3	(5)
47.	A mass of 0.25 kg of an ideal gas has a pressure of 300 kPa, a temperature of 80 °C and a volume of 0.07 m ³ . The gas undergoes an irreversible adiabatic process to a final pressure of 300 kPa and a final volume of 0.10 m ³ , during which the workdone on the gas is 25 kJ. Evaluate C _p and C _v of the gas and increase in entropy of the gas.	CO1	(5)
48.	Explain the process of heating and humidification?	CO4	(5)
49.	Air at 20 °C, 40% R.H is mixed adiabatically with air at 40 °C, 40 % R.H in the ratio of 1 kg of former with 2 kg of the latter. Find the final condition of the air.	CO4	(5)
50.	Write down the van der waals equation of state. How does it differ from the ideal gas equation of state?	CO2	(5)
PART C(2 X 10 = 20 MARKS) (ANSWER ANY TWO)			
51.	Air flows steadily at the rate of 0.5 kg/s through an air compressor, entering at 7 m/s velocity, 100kPa pressure, and 0.95 m ³ /kg volume, and leaving at 5 m/s, 700 kPa and 0.19 m ³ /kg. The internal energy of air leaving is 90 kJ/kg greater than that of the air entering. Cooling water in the compressor jackets absorbs heat from the air at the rate of 58 kW. (a) Compute rate of shaft work input to the air in kW. (b) Find the ratio of the inlet pipe diameter to outlet pipe diameter.	CO1	(10)
52.	A vessel of Volume 0.04 m ³ contains a mixture of saturated water and saturated steam at a temperature of 250 °C. The mass of the liquid present is 9 kg. Find the pressure, the mass, the specific volume, the enthalpy, the entropy and the internal energy.	CO3	(10)
53.	An air conditioning system is designed under the following conditions: Out door conditions- 30 °C dbt, 75% R.H. Indoor conditions- 22 °C dbt, 70% R.H. Amount of free air circulated- 3.33 m ³ /s Coil dew point temperature- 14 °C The required condition is achieved first by cooling and de humidification, and then by heating. Estimate (a) the capacity of the cooling coil in tones (b) the capacity of the heating coil in kW and (c) the amount of ater vapour removed in Kg/s.	CO4	(10)

ALL THE BEST