A **Reg. No. :** | | | | | | | | | | |

Question Paper Code: 53703

B.E. / B.Tech. DEGREE EXAMINATION, APRIL 2024

Third Semester

Mechanical Engineering

15UME303 - ENGINEERING THERMODYNAMICS

(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. The characteristics equation of gases PV = mRT holds good for CO1- R

   (a) monoatomic gases (b) atomic gases (c) real gases (d) ideal gases

2. The unit of power in SI unit is CO1- R

   (a)Watt (b)Nmm (c) Nm (d) Pa

3. Second law of thermodynamics defines CO2- R

   (a) heat (b) work (c) enthalpy (d) entropy

4. The PMM- I kind violates _____law of thermodynamics CO2- R

   (a) Zeroth (b) First (c) Second (d) Third

5. Joules law states that the specific internal energy of a gas depends only on CO3- R

   (a) the pressure of the gas (b) the volume of the gas

   (c) the temperature of the gas (d) None of these

6. In throttling process, which property remains constant CO3- R

   (a) Pressure (b) Temperature (c) Enthalpy (d) Entropy

7. The latent heat of vapourisation at critical point is CO4- R

   (a) less than zero (b) greater than zero

   (c) equal to zero (d) none of the above.

8. Clapeyron equation is applicable for CO4- R

(a) Saturation point of vapour (b) Saturation point of liquid

(c) Triple point (d) Boiling point

9. In an unsaturated air the state of a vapour is CO5- R

(a) wet (b) super heated (c) saturated (d) unsaturated

10. In sensible cooling process, _____temperature remains constant. CO5- R

(a) Wet bulb (b) Dry bulb (c) Dew point (d) None of these

PART – B (5 x 2= 10 Marks)

11. What are the types of system. Give exambles. CO1- R

12. What is reversibility? CO2- R

13. What do you understand by triple point. CO3- R

14. What is meant by compressibility. CO4- R

15. What is sensible heating. CO5- R

PART – C (5 x 16= 80 Marks)

16. (a) A piston cylinder device operates 1 Kg of fluid at 20bar pressure. The initial volume is 0.04 m^3. The fluid allowed to expand reversibly following the process $PV^{1.45} = C$ so that the volume becomes double. The fluid is then cooled at constant pressure until the piston comes back to the original position. Keeping the piston unaltered, heat is added reversibly to restore it to the initial pressure. Draw the PV diagram and calculate the work down in the system. CO1- App (16)

Or

(b) In a gas turbine installation the gases enters the turbine at the rate of 5 kg/sec with a velocity of 50m/sec and the enthalpy of 900 KJ/Kg and leaves the turbine with 150 m/sec and enthalpy of 400 KJ/Kg. The loss of heat from the gases to the surrounding is 25 KJ/Kg. Assume R = 0.285 KJ/KgK, Cp = 1.004 KJ/KgK and inlet condition to be at 100Kpa and 27°c. Determine the work done and diameter of the inlet pipe. CO1- App (16)

17. (a) Describe the releation between Kelvin plank and clausis statement of second law of thermodynamics? CO2- App (16)

Or

	(b)	A cyclic heat engine operates between the temperature limits of 900° C and 30° C. What is the least rate of heat rejected from the engine per kW net work output of the engine?	CO2- App	(16)
18.	(a)	Describe the thermodynamic properties of pure substance in solid,liquid and phases ?	CO3- App	(16)
		Or		
	(b)	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 water is 9 kg. Determine pressure, specific volume, specific entropy and specific enthalpy of the mixture.	CO3- App	(16)
19.	(a)	State and prove vanderwaal equation?	CO4- U	(16)
		Or		
	(b)	State and prove the clausis clapeyron equation?	CO4- U	(16)
20.	(a)	The sling psychrometer in a laboratory test recorded the following reading. DBT = 35°c and WBT = 25°c. Calculate the following (i) specific humidity (ii) relative humidity (iii)vapour density of air (iv) dew point temperature (v) enthalpy of mixture. Take atmospheric pressure is 1.0132bar.	CO5- App	(16)
		Or		
	(b)	Determine the properties of air at atmospheric pressure (1.01325 bar) has a dry bulb temperature of 32°C and wet bulb temperature of 24° C.	CO5- App	(16)

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