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

Question Paper Code: 54A05

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2018

Fourth Semester

Agricultural Engineering

15UAG405- FUNDAMENTALS OF THERMODYNAMICS

(Regulation 2015)

(Provide Scientific Calculator, Psychrometry Chart)

Duration: Three hours Maximum: 100 Marks

PART A - (10 x 1 = 10 Marks)

1. General gas equation is CO1 -R

   (a) PV=nRT (b) PV=mRT (c) PV = C (d) PV=KiRT

2. The value of one bar (in SI units) is equal to CO1 -R

   (a) 100 N/m^2 (b) 1×10^5 N/m^2 (c) 1×10^4 N/m^2 (d) 1×10^6 N/m^2.

3. Carnot engine is a ---------- CO2 -R

   (a) Reversible engine (b) Irreversible engine

   (c) Possible engine (d) Refrigerator

4. For any reversible process, the change in entropy of the system and surroundings is CO2- R

   (a) zero (b) unity (c) negative (d) positive

5. The latent heat of vapourisation at critical point is CO3 -R

   (a) less than zero (b) greater than zero (c) equal to zero (d) 2257 kJ/kg

6. Dryness fraction is experimentally measured by ---------- CO3 -R

   (a) Throttling calorimerer (b) venturimeter

   (c) nanometer (d) thermometer

7. Boyle's low states that volume of given mass of a gas varies inversely with its absolute pressure when the ---------- remains constant CO4 -R

   (a) volume (b) temperature (c) entropy (d) atmosphere

8. The value of the universal gas constant is CO4 -R

(a) 8.314 J/kg K (b) 83.14 kJ/kg K (c) 848 kJ/kg K (d) 8.314 kJ/kg K.

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

(a) wet (b) superheated (c) saturated (d) unsaturated.

10. At dew point temperature ---------- CO5- R

(a) water vapour begins to condense (b) vapour is competely changed in to water

(c) water is directly changed in to ice (d) ice is directly changed in to water

PART – B (5 x 2= 10Marks)

11. What is the difference between open system and closed system?. CO1- R

12. State the Kelvin -Plank statement of second law of thermodynamics. CO2 -R

13. State the phase rule for pure substance. CO3- R

14. Write the difference between ideal and real gas. CO4- R

15. What is the difference between DBT and WBT? CO5- R

PART – C (5 x 16= 80Marks)

16. (a) A mass of air is initially at 260^{o}C and 700 kpa, and occupies 0.028m^{3}.The air is expanded at constant pressure to 0.084m^{3}.A polytrophic process with n=1.5 is then carried out, followed by a constant temperature process which completes a cycle. All the process are reversible.(a)sketch the cycle in T-S and P-V planes.(b)find the heat received and heat rejected in the cycle.(c)Find the efficiency of the cycle. CO1- R (16)

Or

(b) In a gas turbine unit, the gases flow through the turbine is 15 kg/s and the power developed by the turbine is 12000 kW. The enthalpies of gases at the inlet and outlet are 1260 kJ/kg and 400 kJ/kg respectively, and the velocity of gases at the inlet and outlet are 50 m/s and 110 m/s respectively. Calculate :
(i) The rate at which heat is rejected to the turbine, and
(ii) The area of the inlet pipe given that the specific volume of the gases at the inlet is 0.45 m^{3}/kg. CO1 -App (16)

17.	(a)	Two-Carnot engine A and B are operated in series. The first one A receives heat at 870K and rejects to a reservoir at temperature T. The second engine B receives the heat rejected by the first engine and in turn rejects to a heat reservoir at 300K. Calculate the intermediate temperature T in ^{0}C between two heat engines for the following cases. (a) The work output of the two engines are equal and The efficiencies of the two engines are equal.	CO2- R	(16)
		Or		
	(b)	(i) Prove that entropy is a property of a system.	CO2 -U	(8)
		(ii) What are the characteristics of entropy.	CO2 -U	(8)
18.	(a)	A vessel of volume 0.04m^3 contains a mixture of saturated water and steam at a temperature of 250^{0}C.The mass of the liquid present is 9kg. Find the pressure, mass, specific volume, enthalpy, entropy and internal energy of the mixture.	CO3 -Ana	(16)
		Or		
	(b)	Describe the different operations of Rankine cycle. Derive also the expression for its efficiency.	CO3 -Ana	(16)
19.	(a)	Consider an ideal gas at 303K and 0.86m^3/kg. As a result of some disturbance the state of the gas changes to 304K and 0.87 m^3/kg. Estimate the change in pressure of the gas due to the result of this disturbance.	CO4- U	(16)
		Or		
	(b)	Derive Clausius Clapeyron equation and explain its importance.	CO4 -U	(16)
20.	(a)	An air-water vapour mixture enters an adiabatic saturator at 30^{0}C and leaves at 20^{0}C, which is the adiabatic saturation temperature. The pressure remains constant at 100 kPa. Determine the relative humidity and humidity ratio of the inlet mixture.	CO5 -Ana	(16)
		Or		
	(b)	On a skeleton Psychrometric chart show the following processes and explain. (i) Sensible heating (ii) Sensible cooling (iii) Cooling and humidification (iv) Heating and dehumidification	CO5- U	(16)