



KERALA AGRICULTURAL UNIVERSITY
B.Tech.(Food Technology) 2022 Admission
II Semester Final Examination – September 2023

Pafe.1206

Food Thermodynamics (2+0)

Marks: 50
Time: 2 hours

- I Fill in the blanks** **(10x1=10)**
1. Temperature scales work on law of thermodynamics.
 2. The area enclosed by a curve in a p-v diagram gives
 3. The net change in internal energy in a cycle will be alwayskJ.
 4. The process is reversible when the andreturns to its initial state.
 5. Work done in a constant volume process is
 6. A steam power plant works on cycle.
 7. In Otto cycle, heat addition takes place at constant
 8. The difference between dry bulb temperature and wet bulb temperature is called as
 9. The dryness fraction value for dry saturated steam is
 10. In a psychrometric sensible heating process, the moisture content
- II Write short notes on ANY FIVE of the following** **(5x2=10)**
1. Write the relationship between internal energy and enthalpy.
 2. Distinguish between intensive and extensive properties.
 3. State the Kelvin-Planck statement of Second law of Thermodynamics.
 4. Define available energy.
 5. Sketch the p-v and T-s diagrams of a Carnot cycle.
 6. List the processes of an ideal Brayton cycle.
 7. Sketch the process of heating and humidification in a simple psychrometric chart.
- III Answer ANY FIVE of the following.** **(5x4=20)**
1. Distinguish between open and closed systems. Give examples.
 2. At inlet to a certain nozzle, the fluid parameters are: enthalpy = 2850 kJ/kg, velocity = 50 m/s, area = 0.1 m² and specific volume = 0.18 m³/kg. At the discharge end, the enthalpy is 2650 kJ/kg and specific volume is 0.49 m³/kg. Calculate the velocity of fluid at exit from the nozzle.
 3. A cylindrical vessel of 1 m diameter and 4 m length has hydrogen gas at a pressure of 100 kPa and 27°C. Determine the amount of heat to be supplied to increase the gas pressure to 125 kPa. For hydrogen, take $c_p = 14.307 \frac{kJ}{kgK}$, $c_v = 10.183 \frac{kJ}{kgK}$
 4. Prove the equivalence of Kelvin Planck and Clausius statements of the Second Law of Thermodynamics.
 5. List the components of a vapor compression refrigeration system. Sketch the processes in a p-h plane.
 6. With a simple sketch, explain the working of a sling psychrometer.
 7. The atmospheric air enters the adiabatic saturator at 33°C DBT and 23°C WBT. The barometric pressure is 740 mm of mercury. Determine the vapor pressure at 33°C.

IV**Write an essay on ANY ONE of the following****(1x10=10)**

1. A piston cylinder machine contains a fluid system which passes through a complete cycle of four processes. During a cycle, the sum of all heat transfers is -170 kJ. The system completes 100 cycles per minute. Complete the following table and compute the net rate of work output in kW.

Process	Q (kJ/min)	W (kJ/min)	ΔE (kJ/min)
a - b	0	2170	?
b - c	21000	0	?
c - d	-2100	?	-36600
d - e	?	?	?

2. (a) Sketch the layout of an ideal steam power plant and indicate the different processes in the p-v and T-s diagrams.
(b) Highlight the change in the layout and T-s diagram when a reheater is added to the steam power plant.
