KERALA AGRICULTURAL UNIVERSITY

B.Tech.(Food Technology)
II Semester Final Re - Examination – August 2025
2023 & Previous admission

Pafe.1206 **Food Thermodynamics (2+0)** **Marks: 50**
Time: 2 hours

I **Fill in the blanks** **(10x1=10)**

1. Heat and work are …….. functions.
2. Efficiency of Carnot engine with $t_1 = 327^0C$ and $t_2 = 27^0C$ is ……..
3. …….. remains constant in throttling process.
4. In Otto cycle heat addition takes place at constant ……
5. Entropy of an isolated system either …….. or ……..

State True or False

6. The basic cycle used in thermal power plant is Brayton cycle.
7. The product of the characteristics gas constant and molecular weight of an ideal gas is the universal gas constant.
8. The latent heat of vaporization of steam is zero at critical point.
9. Relative humidity remains constant during sensible heating or cooling.
10. The first law of thermodynamics is the law of conservation of heat.

II **Write short notes on ANY FIVE of the following** **(5x2=10)**

1. What do you mean by extensive and intensive properties of a system?
2. State Clausius statement of second law of thermodynamics.
3. State the principle of increase of entropy.
4. What is an adiabatic process? Will it be a slow process or fast process?
5. State the differences between dry bulb and wet bulb temperatures.
6. What do you mean by steady flow process and unsteady flow process?
7. What is meant by quality of steam? Which device is used to measured the quality of steam?

III **Answer ANY FIVE of the following** **(5x4=20)**

1. Write down the steady flow energy equation for a single stream entering and leaving a control volume and explain the various terms in it.
2. What do you mean by reversible and irreversible processes? What are the causes of irrevesibility?
3. Define COP of a refrigeration cycle. How will you express the capacity of a refrigeration plant? Name a few refrigerants.
4. Establish the following relation for air-vapour mixture in case of moist air: $\omega = 0.622 \times \frac{p_v}{p - p_v}$, where p_v is the partial pressure of water vapour and p is the atmospheric pressure.
5. A fluid is flowing steadily through a nozzle. At the inlet, the fluid has a velocity of 50 m/s, enthalpy of 2850 kJ/kg and specific volume of 0.18 m^3/kg. At the discharge end (outlet), the enthalpy is 2650 kJ/kg and specific volume is 0.49 m^3/kg. Taking the inlet area of the nozzle as 0.1 m^2, calculate the velocity of the fluid at the exit from the nozzle, mass flow rate of fluid and the exit area of the nozzle. Assume the nozzle to be horizontal and there is no heat loss from it.

6. A cold storage is to be maintained at -5^0C while the surroundings are at 35^0C. The heat leakage from the surroundings into the cold storage is estimated to be 29kJ/s. The actual coefficient of performance of the refrigeration plant is one-third of an ideal plant working between the same temperature limits. Find the power required to drive the pump.
7. Calculate the entropy change when 0.14 kg mass of a gas initially at temperature of 170^0C expands with a volume ratio of 5.4 accordingly to the law $pv^{1.24} = \text{constant}$. Take, $\gamma = 1.4$ and $R = 0.287$ kJ/kg-K.

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

1. Basic cycle for the thermal power plant
2. Otto cycle

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