

Reg No:.....

K25FY2470 B

Name :.....

**Second Semester FYUGP Physics Examination**  
**APRIL 2025 (2024 Admission onwards)**  
**KU2DSCPHY124 (HEAT AND THERMODYNAMICS)**  
(DATE OF EXAM: 30-4-2025)

Time : 90 min

Maximum Marks : 50

**Part A (Answer any 6 questions. Each carries 2 marks)**

1. Distinguish between adiabatic wall and diathermic wall. 2
2. Differentiate between isothermal and adiabatic processes. 2
3. What happens to the pressure of a gas during adiabatic compression? 2
4. Define internal energy. Internal energy of an ideal gas depends on which thermodynamic parameter? 2
5. How is the efficiency of a heat engine defined? 2
6. Why is it impossible to convert all heat energy into work in a cyclic process? 2
7. Why does entropy always increase in a natural (spontaneous) process? 2
8. Explain the concept of entropy in terms of energy dispersal. 2

**Part B (Answer any 4 questions. Each carries 6 marks)**

9. Explain the construction of a Celsius scale and Fahrenheit temperature scale, derive a relationship for converting Celsius temperature value and Fahrenheit value. 6
10. One gram of water ( $1\text{cm}^3$ ) becomes  $1671\text{cm}^3$  of steam when boiled at a constant pressure of 1atm. The heat of vaporization at this pressure is  $L_v = 2.256 \times 10^6 \text{ J/Kg}$ . Compute (a) the work done by the water when it vaporizes and (b) its increase in internal energy. 6
11. What are the different types of thermodynamic processes, and how can each be explained with examples? 6
12. Define the terms (i) heat engine (ii) refrigerator and (iii) carnot engine. 6
13. Show that the entropy change in a Carnot cycle is zero. 6
14. Calculate the entropy change in the free expansion process of n moles of an ideal gas at temperature T using the number of microstates in the initial and final macroscopic states. 6

**Part C (Answer any 1 question(s). Each carries 14 marks)**

15. (a) Discuss in detail the different mechanisms of heat transfer. 7

- (b) Explain the different temperature scales (Celsius, Fahrenheit, and Kelvin) and derive the conversion formulas between them. Discuss the significance of the Kelvin scale in scientific measurements and explain why absolute zero is unattainable. 7
16. (a) State and explain the Kelvin-Planck and Clausius statement of the second law of thermodynamics. Draw Energy-flow diagrams showing that the two forms of the second law are equivalent. 7
- (b) With a neat energy flow diagram explain the working of a heat engine. Derive the expression for the efficiency of a heat engine. 7