

EASTERN UNIVERSITY, SRI LANKA

SECOND YEAR FIRST SEMESTER EXAMINATION IN SCIENCE -

2021/2022

(Mar/Apr - 2024)

PH 2021 THERMODYNAMICS

Time: 01 hour

Answer ALL Questions

1.

- (i) State the First Law of Thermodynamics. (10marks)
- (ii) Distinguish between External work done and Internal work done by a Thermodynamic system. (20marks)
- (iii) Derive an equation for the work done (W) in an adiabatic process from initial volume V_i to final volume V_f in terms of Pressure (P) and Volume (V). (30marks)
- (iv) In a frictionless, fully insulated piston-cylinder arrangement, when an external force is applied to the piston the ideal gas inside the cylinder is compressed from initial volume 2 m^3 to a final volume V while its pressure increases from 100 kPa to 200 kPa .
- (a) Sketch the P - V diagram for the above thermodynamic process. (10marks)
- (b) Calculate the initial volume of the ideal gas. (10marks)
- (c) Calculate the external work done on the system at room temperature. (20marks)

Given that the Universal gas constant is 287 J/kg.K .

2.

(i) What do you mean by the term "Adiabatic Process" in thermodynamics. (10marks)

(ii) Show that the work done on adiabatic expansion of an ideal gas from pressure- volume values (P_1, V_1) to (P_2, V_2) is,

$$W_{adiabatic} = \frac{1}{\gamma - 1} [P_1V_1 - P_2V_2]$$

(50marks)

(iii) In a closed system, a particular mass of ideal gas is compressed in an adiabatic process, and the pressure and volume changes from 80 kPa to 400 kPa, and 0.1 m³ to 0.03 m³ respectively. Find the value of γ and work done by the gas system.

(40marks)

...End of Exam...