

**Federal University of Technology, Minna.**  
**Department of Industrial and Technology Education**

Session: 2021/2022 First Semester Examination  
Course Title: Thermodynamics.  
Course Code: ITE 517  
Time Allowed: 2 Hours  
Instruction: Attempt any other four (4) Questions

1. A gas at a pressure of  $700\text{KN/m}^2$ , volume of  $2.5\text{dm}^3$  and temperature of  $1100^\circ\text{C}$  expands isothermally to a pressure of  $270\text{KN/m}^2$  according to the law  $PV^{1.3} = \text{constant}$ . Determine: (i) the final volume (ii) the final temperature (iii) work done (iv) change in internal energy.
- 2a. List and explain the three major thermodynamics properties of the working fluid in a system
- 2b. Explain the followings as it relates to thermodynamics  
(i) Internal energy (ii) Enthalpy (iii) Entropy
- 3a. Define a system and illustrate with a diagram of system/boundary
- 3b.  $0.675\text{kg}$  of gas at  $1.4\text{MN/m}^2$  pressure and  $280^\circ\text{C}$  is expanded to 4 times the original volume according to the law  $PV^{1.3} = \text{constant}$ . Determine (i) the original and final volume of the gas (ii) the final pressure of the gas (iii) the final temperature of the gas. Take  $R = 0.287\text{KJ/KgK}$
- 4a. List and explain the three types of a system
- 4b. Explain the following processes associated with thermodynamics  
(i) Adiabatic (ii) Isothermal (iii) Isobaric (iv) Isochoric
- 5a. The second law of thermodynamics can be stated in several equivalent ways. State the three ways in which this law can be stated
- 5b. A gas whose original pressure and temperature were  $300\text{KN/m}^2$  and  $25^\circ\text{C}$  respectively, is compressed according to the law  $PV^{1.4} = \text{constant}$  until it becomes temperature  $180^\circ\text{C}$ . Determine the new pressure of the gas
- 6a. Distinguish between reversibility change and irreversibility change
- 6b. State the five (5) advantages and five (5) disadvantages of CI engines over SI engines