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

Session: 2019/2020 First Semester Examination
Course Title: Thermodynamics.
Course Code: ITE 517
Time Allowed: 2 Hours
Instruction: Attempt Any Four (4) Questions Only

1a. List and explain the three major thermodynamics properties of the working fluid in a system

1b. Explain the followings as it relates to thermodynamics
(i) Internal energy (ii) Enthalpy (iii) Entropy

2a. The second law of thermodynamics can be stated in several equivalent ways. State the three ways in which this law can be stated

2b. A gas whose original pressure and temperature were 300KN/m^2 and 25°C respectively, is compressed according to the law $PV^{1.4}$ = constant until it becomes temperature 180°C. Determine the new pressure of the gas

3a. Explain the following processes associated with thermodynamics
(i) Adiabatic (ii) Isothermal (iii) Isobaric (iv) Isochoric

3b. List and explain the three types of a system

3c State four (4) ways in which heat affects objects

4a. Distinguish between reversibility change and irreversibility change

4b. State the five (5) advantages and five (5) disadvantages of CI engines over SI engines

5a. State the first law of thermodynamics and show its relationship between work, heat and internal energy

5b. A gas at a pressure of 1.4MN/m^2 and temperature 360°C is expanded adiabatically to a pressure of 100 KN/m^2. The gas is then heated at a constant volume until it again attains 360°C when its pressure is to be 220KN/m^2 and finally it is compressed isothermally until the original pressure of 1.4MN/m^2 is attained. Sketch the PV diagram for this process and if the gas has a mass of 0.23kg. Find
(i) the value of the adiabatic index r (ii) the change in the internal energy of the gas during the adiabatic expansion. Take cp = 1.005 kJ/kg K, R = 0.3015 Nm/kg K

6a. Define a system and illustrate with a diagram the generic thermodynamic system

6b. A gas at a pressure of 700KN/m^2, volume of 2.5dm^3 and temperature of 1100°C expands isothermally to a pressure of 270KN/m^2 according to the law $PV^{1.3}$ = constant.
Determine: (i) the final volume (ii) the final temperature (iii) work done (iv) change in internal energy