



ANJUMAN-I-ISLAM'S
KALSEKAR TECHNICAL CAMPUS, NEW PANVEL
School of Engineering & Technology

Subject: Thermodynamics

Marks: 20

Class: S.E.M.E -1 & S.E.M.E -2

Date: 15/09/2016

Duration: 1Hr

Branch: Mechanical

- Instructions:**
1. Assume suitable data if required.
 2. Draw neat sketches to illustrate your answers.
 3. Figure to right indicate full marks.

Solve any **five**. Each question carries **four** marks.

1. State the Zeroth Law of Thermodynamics. What is its significance?
2. State and explain the equivalence of Kelvin Plank and Clausius statements of Second Law of Thermodynamics.
3. Show that entropy is property of system.
4. Derive an expression for availability of non-flow (closed) system.
5. A gas initially at 14.4 bar and 360 °C is expanded isothermally to a pressure of 2.24 bar. It is then cooled at constant volume till the pressure falls to 1.02 bar. Finally an adiabatic compression brings the gas back to initial state. The mass of gas is 0.23 kg and $C_p = 1$ kJ/kg K. Draw the P-V diagram and determine:
 - a) The value of the adiabatic index of compression.
 - b) The change in internal energy of the gas during the adiabatic process.
6. In a steady flow system fluid flows at the rate of 5 kg/s. It enters at a pressure of 620 kPa, velocity of 300 m/s, internal energy 2100 kJ/kg and specific volume $0.37 \text{ m}^3/\text{kg}$. It leaves at a pressure of 130 kPa, velocity of 150 m/s, internal energy 1500 kJ/kg and specific volume $1.2 \text{ m}^3/\text{kg}$. During its flow through the system, there is a heat loss of 30 kJ/kg. Determine power capacity of engine. Neglect change in P.E.
7. A engine with 30% efficiency drives a refrigerator having COP of 5. What is heat input into the engine if 10 MJ of heat is removed from cold body by refrigerator? Find total quantity of heat rejected to the surrounding.