

Roll No

MMTP-102

M.E./M.Tech., I Semester

Examination, November 2019

Thermodynamics and Combustion

Time : Three Hours

Maximum Marks : 70

- Note:** i) Attempt any five questions.
ii) All questions carry equal marks.

- ✓ 1. a) Give the Thermodynamic definition of work. State and explain Zeroth Law of thermodynamics. Why it is called so?
b) A Barometer reads 76cm of Hg. What would be the absolute pressure of
 - i) A pressure gauge connected to a steam main line leading to inlet of steam turbine reads 28 bar and
 - ii) A vacuum gauge connected to exhaust line of the same turbine reads equivalent to 910cm of water column.Express the absolute pressure in both cases in KPa.
2. a) An ideal gas at a given state expand at a fixed final volume first at constant pressure and then at constant temperature. For which casework done greater.
b) What do you mean by Phase and Reaction equilibrium?
3. a) Find the enthalpy and internal energy of the steam when the pressure is 2MPa and specific volume is 0.11 m³/kg.
b) Write short note on the Joule-kelvin effect.

- ✓ 4. a) Using the principal of first order of transition drive the Clapeyron's equation.
b) Explain the generalized compressibility chart.
5. 10kg of air at 100°C is stored in a rigid cylinder of volume 0.05 cubic meters. Calculate the pressure using Van Der Waal's equation of state. The properties of air at critical point are $P_c = 38.467 \text{ bar}$, $T_c = 137.24\text{K}$ and $V_c = 0.093\text{m}^3/\text{kg mole}$.
6. a) Determine the fuel gas analysis and air-fuel ratio by weight when a medium viscosity fuel oil with 84.9% carbon, 11.14% Hydrogen, 3.2% Sulphur, 0.4% Oxygen and 0.1% Ash is burned with 20% excess air. Assume complete combustion.
b) Explain Laminar and Turbulent flames.
- ✓ 7. a) Compare combustion of solid, liquid and gaseous fuels.
b) Discuss properties and structures of Pre-mixed and diffusion flames.
- ✓ 8. Write short note on the following: (Any three)
 - a) Define triple point. Write property's (P, V and T) of water at this point.
 - b) Entropy and enthalpy charts
 - c) Spontaneous Ignition Temperature (SIT)
 - d) Define steady state and steady flow