

3060

B.Tech. 3rd Semester (Mechanical Engg.) (G-Scheme)

Examination, November-2023

THERMODYNAMICS

Paper-PCC-ME-213-G

Time allowed : 3 hours]

[Maximum marks : 75

Note : Attempt any five questions in all, selecting one question from each unit. Question no. 1 is compulsory. All questions carries equal marks.

1. Explain the following : 6×2.5=15
- (a) Reversible and irreversible processes
 - (b) Internal energy and enthalpy
 - (c) Sensible heat and latent heat
 - (d) PMM2
 - (e) Dryness fraction
 - (f) Carnot theorem

Unit-I

2. Derive the expression for work done in various non flow processes. 15
3. (a) What is a PMM1 ? Why is it impossible ? 4
- (b) What is first Law of Thermodynamics ? 4
- (c) Show that work is a path functions and not a property. 7

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[P.T.O.]

Unit-II

4. (a) Draw phase equilibrium diagram for a pure substance on t-s plot with relevant constant property lines.
- (b) What is critical state ? Explain the terms critical pressure, critical temperature and critical volume of water ? 15
5. Find the specific volume, enthalpy and internal energy of wet steam at 18 bar with dryness fraction $(x) = 0.85$, by using Steam Tables and Mollier chart. 15

Unit-III

6. 0.8 kg of air flow through compressor under steady state conditions. The properties of air at entry are : pressure 1 bar, velocity 10m/s, specific volume 0.95 kg/m^3 and internal energy 30 KJ/kg . The corresponding values at exit are : 8 bar, 6m/s, 0.2 kg/m^3 and 124 KJ/kg . Neglecting the change in potential energy, Calculate the power output and pipe diameter at entry and exit. 15
7. State and discuss the Kelvin-Planck and Clausius statement of Second Law of Thermodynamics. 15

Unit-IV

8. Air enters a compressor at 1 bar, 30°C , which is also the state of environment. It leaves at 3.5 bar, 141° and 90m/s. Neglecting inlet velocity and P.E. effect, Determine :

- (a) Whether the compression is adiabatic or polytropic
- (b) If not adiabatic, the polytropic index
- (c) The isothermal efficiency
- (d) The minimum work input and irreversibility and
- (e) Second law efficiency.

Take C_p of air = 1.0035kJ/kgK

15

9. Explain the Carnot cycle. Derive its thermal efficiency relation and draw the p-v and t-s diagram.

15