Sr. No 013408

May 2023

B.Tech. (ME) Re-appear IV SEMESTER

Applied Thermodynamics (PCC-ME-202)

Time: 3 Hours | Max. Marks:75

Instructions:
1. *It is compulsory to answer all the questions (1.5 marks each) of Part -A in short.*
2. *Answer any four questions from Part -B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*
4. *Use of Steam table , psychrometric chart is allowed*

PART -A

Q1 (a) What is enthalpy of formation? (1.5)

(b) Draw the Brayton cycle on p-v and T-s chart. (1.5)

(c) For a given T_2, show how the Rankine cycle efficiency depends on the mean temperature of heat addition. (1.5)

(d) What is thermodynamic wet bulb temperature? (1.5)

(e) Define the term specific humidity and degree of saturation. (1.5)

(f) What is a stagnation state? (1.5)

(g) What do you mean by perfect intercooling? (1.5)

(h) What is a Mach number? (1.5)

(i) Write the advantages of multistage compression. (1.5)

(j) What is the principle of operation of steam turbines? (1.5)

PART -B

Q2 (a) The following is the ultimate analysis of a sample of petrol by weight: (15)
Carbon=85 % ; Hydrogen=15 %.
Calculate the ratio of air to petrol consumption by weight if the volumetric analysis of the dry exhaust gas is:
CO_2=11.5 % ; CO=1.2 % ; O_2=0.9 % ; N_2=86 %.
Also find percentage excess air.

Q3 (a) Explain vapour compression refrigeration system (VCRS) with a neat sketch. Draw all the processes on T-s and P-h chart and also derive the expression of C.O.P for VCRS in terms of enthalpy. (10)

(b) Derive the air standard thermal efficiency of otto cycle in terms of compression ratio (r) and adiabatic constant (γ). (5)

Q4 (a) Air at 15°C dry bulb temperature and 25 % relative humidity is heated and humidified at 30°C dry bulb temperature and 50 % relative humidity. Using psychrometric chart, calculate the heat and moisture added to air and the sensible heat factor for the process. (10)

(b) Name any five psychrometric processes and represent them on the psychrometric chart. (5)

Q5 (a) Show that the discharge through a nozzle is maximum when there is sonic condition at its throat. (10)

(b) What is a Fanno line? Why do the end states of a normal shock lie on the Fanno line? (5)

Q6 Explain the working of a reciprocating compressor? Show that the optimum intermediate pressure of a two-stage reciprocating compressor for minimum work is the geometric mean of the suction and discharge pressures. (15)

Q7 What do you mean by compounding? Explain pressure compounding and velocity compounding in detail with neat sketch. (15)

****