Register No : _____

THE KAVERY ENGINEERING COLLEGE

(An Autonomous Institution)

B.E/B.TECH DEGREE END SEMESTER THEORY EXAMINATIONS, NOV/DEC 2025

Third Semester

Chemical Engineering

CH3301 / UCHT24301 – Basic Mechanical Engineering

(Steam Table/Charts Can be Permitted)

Regulations – 2021 & 2024

Duration : 3 Hrs *Maximum : 100 Marks*

*PART – A (ANSWER ALL QUESTIONS) (Marks 10*2=20)*

Q.No	*Questions*	*BTL*	*CO*	*Marks*
1.	State the Zeroth law of thermodynamics with an example.	L1	1	2
2.	Write the Kelvin–Planck and Clausius statements of second law of thermodynamics.	L1	1	2
3.	What is the expression for work done in an isothermal process.	L2	2	2
4.	Differentiate between throttling process and free expansion process.	L2	2	2
5.	Define air standard efficiency and state its importance in cycle analysis.	L2	3	2
6.	List the assumptions made in the analysis of Otto cycle.	L1	3	2
7.	Explain the difference between SI and CI engines.	L2	4	2
8.	Compare dry steam and superheated steam.	L2	4	2
9.	State the function of a flywheel in reciprocating engines.	L1	5	2
10.	Define slip and creep in belt drives.	L1	5	2

*PART – B (ANSWER ALL QUESTIONS) (Marks 5*16 = 80)*

Q.No			*Questions*	*BLT*	*CO*	*Marks*
11.	a	i	Explain the First Law of Thermodynamics with suitable engineering applications.	L2	1	8
		ii	A heat engine receives 1500 kJ/min at 600 K and rejects heat at 300 K. Determine the Carnot efficiency and power output.	L3	1	8
			Or			
	b	i	Derive the steady flow energy equation for a control volume with assumptions.	L3	1	8
		ii	Explain the working of a heat pump and refrigerator with a neat sketch.	L2	1	8
12.	a	i	Derive expressions for work done and heat transfer during a polytrophic process.	L3	2	8
		ii	A gas expands polytropically with n = 1.3 from 200 kPa and 0.2 m^3 to 800 kPa. Calculate work done.	L4	2	8
			Or			

	b	i	Derive the expression for heat transfer during an adiabatic process.	L3	2	8
		ii	Compare isothermal and adiabatic processes with PV diagrams.	L4	2	8
13.	a	i	Explain the factors which affects the efficiency of the Otto cycle.	L2	3	8
		ii	An Otto cycle has a compression ratio of 7 and initial pressure of 1 bar, temperature 300 K. Find efficiency.	L4	3	8
			Or			
	b	i	Explain the P–V and T–S diagrams of the Carnot cycle.	L2	3	8
		ii	Compare Otto, Diesel and Dual combustion cycles with respect to efficiency.	L4	3	8
14.	a	i	Explain the construction and working of two-stroke and four-stroke SI engines with neat sketches.	L2	4	8
		ii	Steam at 8 bar and 0.9 dryness fraction is superheated to 250°C. Find enthalpy and entropy using tables.	L3	4	8
			Or			
	b	i	Explain impulse and reaction turbines with neat sketches.	L2	4	8
		ii	Derive an expression for Rankine cycle efficiency.	L3	4	8
15.	a	i	Explain the working of a flywheel using turning moment diagram.	L2	5	8
		ii	A belt drive transmits 15 kW power from a pulley of 500 mm diameter running at 300 rpm. The coefficient of friction = 0.25, wrap angle = 160°. Find belt tensions.	L3	5	8
			Or			
	b	i	Derive the expression for ratio of tensions in a belt drive.	L3	5	8
		ii	Explain static and dynamic balancing of rotating masses with examples.	L2	5	8