

Thermal Engineering (313310)

MSBTE K-Scheme · Mechanical Engg. Sem 3 · Important Questions (repetition analysis of previous papers)

Based on MSBTE papers S-2024...S-2026 available on msbte.ac.in (papers used: W-24, S-25, W-25, S-26). Practice guidance only — not a prediction of the exam. Probability: **High** = asked in 3–4 of the 4 papers, **Medium** = 2 papers, **Low** = once or not yet asked but in the syllabus. “Asked in” shows question number and marks. The last column shows where the topic is covered in our model papers (Set A / B / C). Unit weights are from the K-scheme specification table.

Most repeated topics

#	Topic	Unit	Papers	Times asked
1	Otto / Diesel / Carnot cycle on P–V and T–S (and comparison)	V	4 of 4	5
2	Steady flow energy equation — write, meaning of terms, apply to boiler / turbine / nozzle / condenser	I	4 of 4	4
3	Gas processes on P–V and T–S (isobaric, isochoric, isothermal, ...)	II	4 of 4	4
4	Cooling tower — forced / natural draught (sketch and working)	III	4 of 4	4
5	Numerical — conduction through slab / composite wall	IV	4 of 4	4
6	Heat engine, heat pump, refrigerator — concept / difference / COP relation	I	3 of 4	3
7	Numerical — constant pressure process (work, ΔU , heat)	II	3 of 4	3
8	Numerical — constant volume process (T_2 , ΔU , mass)	II	3 of 4	3
9	Formation of steam at constant pressure — T–H (T–S) diagram	II	3 of 4	3
10	Steam terms — dryness fraction, dry saturated, wet, degree of superheat	II	3 of 4	3

Unit I — Fundamentals of Thermodynamics (syllabus weight 12 marks)

Question / topic	Marks	Asked in	Probability	Model sets
Steady flow energy equation — write, meaning of terms, apply to boiler / turbine / nozzle / condenser	6 M	S-26: Q5a 6M W-25: Q5a 6M S-25: Q5a 6M W-24: Q5a 6M	High	A5a, B5a, C5a
Heat engine, heat pump, refrigerator — concept / difference / COP relation	4 M	W-25: Q2a 4M S-25: Q2a 4M W-24: Q2a 4M	High	A2a, B2a, C2a
Kelvin–Planck and Clausius statements (second law)	4 M	S-26: Q2a 4M W-24: Q2b 4M	Medium	A2b
Zeroth law of thermodynamics (state / explain with example)	2 M, 4 M	W-25: Q3a 4M W-24: Q1a 2M	Medium	B1a
Thermodynamic system — define, classify with examples; property	2 M, 4 M	S-26: Q2b 4M S-25: Q1a 2M	Medium	B2b

Intensive and extensive properties	2 M	W-25: Q1a 2M	Low	A1a
Flow work (concept with sketch)	4 M	S-25: Q2b 4M	Low	—
Define heat / work with SI unit	2 M	S-26: Q1a 2M	Low	C1a
Enthalpy and entropy concepts; first law; heat vs work	—	Not asked yet (in syllabus)	Low	—

Unit II — Ideal Gases and Steam Fundamentals (syllabus weight 16 marks)

Question / topic	Marks	Asked in	Probability	Model sets
Gas processes on P–V and T–S (isobaric, isochoric, isothermal, ...)	2 M, 4 M	S-26: Q1c 2M W-25: Q3b 4M S-25: Q2c 4M W-24: Q2c 4M	High	A2c, B2c, C2c
Numerical — constant pressure process (work, ΔU , heat)	4 M, 6 M	S-26: Q5b 6M W-25: Q4a 4M W-24: Q2d 4M	High	B2d, C2d
Numerical — constant volume process (T_2 , ΔU , mass)	4 M	S-26: Q2d 4M W-25: Q2b 4M W-24: Q3a 4M	High	A2d
Formation of steam at constant pressure — T–H (T–S) diagram	4 M, 6 M	S-26: Q3a 4M W-25: Q6a 6M S-25: Q2d 4M	High	A3a, B5b, C3a
Steam terms — dryness fraction, dry saturated, wet, degree of superheat	2 M	S-26: Q1b 2M W-25: Q1c 2M W-24: Q1b 2M	High	A1c, C1b
Numerical — adiabatic / polytropic process	4 M	S-26: Q4e 4M S-25: Q4e 4M	Medium	A4e, C4e
Universal gas constant — define, unit	2 M	S-25: Q1b 2M W-24: Q1c 2M	Medium	A1b
Sensible heat and latent heat	2 M, 4 M	W-25: Q4b 4M S-25: Q1c 2M	Medium	B1b
Numerical — steam using steam table (quality, enthalpy, volume)	4 M, 6 M	S-25: Q5b 6M W-24: Q4e 4M	Medium	A5b, B4e, C5b
Rankine cycle on P–V and T–S	4 M	S-26: Q2c 4M S-25: Q3a 4M	Medium	B3a
Derive characteristic gas equation (Boyle's and Charles' law)	6 M	W-24: Q5b 6M	Low	C2b
Assumptions of ideal gas	2 M	W-25: Q1b 2M	Low	B1c

Unit III — Components of Steam Power Plant (syllabus weight 18 marks)

Question / topic	Marks	Asked in	Probability	Model sets
Cooling tower — forced / natural draught (sketch and working)	4 M, 6 M	S-26: Q5c 6M W-25: Q2c 4M S-25: Q5c 6M W-24: Q3c 4M	High	A5c, B3c, C3b

Dalton's law of partial pressures	2 M	W-25: Q1d 2M S-25: Q1e 2M W-24: Q1d 2M	High	A1d, B1d, C1c
Surface condenser — sketch, construction, working	4 M	W-25: Q4c 4M S-25: Q3d 4M W-24: Q3b 4M	High	A3c, B3d, C3c
Lamont boiler	6 M	S-26: Q6a 6M W-25: Q5b 6M S-25: Q6a 6M	High	A6a, C6a
Classification of boilers	2 M, 4 M	S-26: Q3b 4M S-25: Q1d 2M W-24: Q3d 4M	High	A3b, B1e
Impulse turbine working (p–V variation) / impulse vs reaction	4 M, 6 M	S-26: Q3c 4M W-25: Q6b 6M W-24: Q6a 6M	High	A3d, C5c
Function of condenser	2 M	S-26: Q1d 2M W-24: Q1e 2M	Medium	C3c
Applications of steam nozzles	2 M	S-26: Q1e 2M W-25: Q1e 2M	Medium	A1e, C1d
Benson boiler	6 M	W-24: Q5c 6M	Low	B6a
Compounding of impulse turbine (velocity compounding)	4 M	S-25: Q3c 4M	Low	B5c
Layout of steam power plant	4 M	S-25: Q3b 4M	Low	B3b
Air leakage in condenser — sources and effects	4 M	S-26: Q3d 4M	Low	B3d
Water tube vs fire tube boiler	4 M	W-25: Q3c 4M	Low	—
Regenerative feed heating and bleeding; boiler definition as per IBR; induced draught tower	—	Not asked yet (in syllabus)	Low	C3d, C6a, C3b

Unit IV — Heat Transfer & Heat Exchangers (syllabus weight 12 marks)

Question / topic	Marks	Asked in	Probability	Model sets
Numerical — conduction through slab / composite wall	4 M, 6 M	S-26: Q4b 4M W-25: Q2d 4M S-25: Q6b 6M W-24: Q4b 4M	High	A4b, B6b, C4b
Radiation terms — black body, absorptivity, reflectivity, transmissivity	2 M, 4 M	S-26: Q1f 2M W-25: Q4d 4M S-25: Q1f 2M	High	A1f, B4b, C1f
Heat exchangers — classification and applications	6 M	S-26: Q6b(ii) 6M W-25: Q5c 6M W-24: Q6b 6M	High	A6b, B1f, C6b
Thermal conductivity — define, unit	2 M	W-25: Q1f 2M W-24: Q1f 2M	Medium	C1e
Modes of heat transfer with examples	4 M	W-24: Q4a 4M	Low	B4a
Fourier's law and Newton's law of cooling	4 M	S-25: Q4a 4M	Low	A4a

Natural vs forced convection	4 M	S-26: Q4a 4M	Low	C4a
Stefan–Boltzmann law	6 M	S-26: Q6b(i) 6M	Low	B4b
Shell and tube heat exchanger (for power plant)	4 M	S-25: Q4b 4M	Low	A6b
Plate type heat exchanger; gray body, emissivity	—	Not asked yet (in syllabus)	Low	C6b, A1f, C1f

Unit V — Introduction to I.C. Engine & Power Cycles (syllabus weight 12 marks)

Question / topic	Marks	Asked in	Probability	Model sets
Otto / Diesel / Carnot cycle on P–V and T–S (and comparison)	2 M, 4 M	S-26: Q1g 2M W-25: Q3d 4M S-25: Q4c 4M, Q4d 4M W-24: Q4d 4M	High	A4c, B4c, C4c, C4d
Engine terms — compression ratio, swept volume, cut-off ratio, m.e.p.	2 M, 6 M	W-25: Q1g 2M W-24: Q1g 2M, Q6c 6M	Medium	A1g, B1g, C1g
Two stroke vs four stroke engine	4 M	S-26: Q4d 4M W-24: Q4c 4M	Medium	A4d
Classification of I.C. engines	2 M, 4 M	S-26: Q4c 4M S-25: Q1g 2M	Medium	B4d
S.I. vs C.I. (petrol vs diesel) engine	4 M, 6 M	S-26: Q6c 6M W-25: Q4e 4M	Medium	B6c
Four stroke engine (S.I. / C.I.) — construction and working	6 M	W-25: Q6c 6M S-25: Q6c 6M	Medium	A6c
Two stroke engine working; dual cycle	—	Not asked yet (in syllabus)	Low	C6c

Paper pattern (same in all four papers)

Q.	Attempt	Marks
1	any FIVE of 7 (2 marks each)	10
2	any THREE of 4 (4 marks each)	12
3	any THREE of 4 (4 marks each)	12
4	any THREE of 5 (4 marks each)	12
5	any TWO of 3 (6 marks each)	12
6	any TWO of 3 (6 marks each)	12
Total (3 hours)		70

Numerical types seen: gas processes (constant pressure / volume, polytropic, adiabatic), steam properties using steam tables, and conduction through slab / composite wall. The syllabus allows no numericals on SFEE, Rankine cycle, Unit III (boilers, turbines, condensers, cooling towers) or power cycles.

Note: This is an **important-questions list prepared by Ananda Technologies** only for practice and exam preparation, based on the pattern of previous MSBTE question papers and the K-scheme syllabus. It is **not an official MSBTE paper**, and it does **not** mean that these questions will come in the exam. Answers follow standard textbook points; marks shown are indicative. Free for students — anandatechnologies.in

