

**DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/MANAGEMENT/  
COMMERCIAL PRACTICE – APRIL - 2023**

**THERMAL ENGINEERING**

[Instructions: 1. Use of steam table and mollier chart is allowed.  
2. Scientific calculator (up to 100Ms) is allowed.]

(Maximum Marks : 75)

[Time : 3 hours]

**PART-A**

**I. Answer all** the following questions in one word or sentence. Each question carries 1 mark.

**(9x1=9 marks)**

		Module Outcome	Cognitive level
1	The expression to find out enthalpy is .....	M1.02	R
2	Properties that depend on the mass of the substance is called	M1.02	R
3	Stoichiometric air fuel ratio of petrol engine is	M2.02	R
4	The cycle which contain two constant volume processes and two isentropic processes is .....	M2.01	R
5	Specify the range of compression ratio in case of diesel engine.	M2.02	R
6	The amount of heat added during phase change of water is called	M3.01	R
7	Specify the name of boiler mounting which is used to drain out the water from the boiler periodically.	M3.05	R
8	Give an example of positive displacement type compressor.	M4.07	R
9	If temperature difference $\Delta T_1$ is 249 K and temperature difference $\Delta T_2$ is 173.5K, find LMTD of heat exchanger.	M4.05	A

**PART B**

**II. Answer any Eight** questions from the following. Each question carries 3 marks.

**(8x3=24)**

		Module Outcome	Cognitive level
1	Make a statement for the following laws a) Charles's law    b) Joule's law    c) Avogadro's law	M1.02	R
2	What is thermodynamic equilibrium?	M1.02	R
3	Draw and mark PV diagram for isothermal process.	M1.04	R
4	Explain about Zeroth law of thermodynamics.	M1.03	U
5	Draw the PV diagram of Carnot cycle and mark the different processes.	M2.01	R
6	Define the following tems. a) Mechanical efficiency    b) specific fuel consumption c) indicated thermal efficiency	M2.06	R
7	What is throttling process?	M3.03	R
8	Draw the principle of fire tube boiler.	M3.05	R
9	The total area of the glass window pane is $0.5\text{m}^2$ . Calculate how much heat is conducted per hour through the glass window pane if thickness of the glass is 6 mm, the temperature of the inside is $23^\circ\text{C}$ and of the outside surface is $2^\circ\text{C}$ , thermal conductivity of glass is $1\text{ W/mK}$ .	M4.02	A
10	Explain about vane type compressors.	M4.07	U

### PART C

Answer **all** questions from the following. Each question carries 7 marks.

**(6x7=42marks)**

		Module Outcome	Cognitive level
III	Draw PV diagram and TS diagram of the following processes a) Isochoric      b) Isobaric      c) Polytropic	M 1.04	R
<b>OR</b>			
IV	A system contains 2kg of gas at 37°C is heated in a reversible non-flow constant volume process, till the pressure is doubled. Find the final temperature, work done, heat transferred and the change in internal energy, Take $c_v = 0.72$ kJ/kgK	M1.05	A
V	With neat diagram explain the working of a four stroke diesel engine.	M2.02	U
<b>OR</b>			
VI	The following particulars refer to a 4-cylinder, 4-stroke petrol engine; bore = 65mm Stroke length = 95mm Torque developed = 64Nm when engine turns 3000 rpm Clearance volume = 63cm <sup>3</sup> for each cylinder Relative efficiency= 0.5 and Calorific value of petrol = 42000kJ/kg Make calculations for brake mean effective pressure and the fuel consumption in kg/hr	M2.05	A
VII	With the help of PV and TS diagram explain about Carnot cycle	M2.01	U
<b>OR</b>			
VIII	With neat diagram explain the working of a two stroke petrol engine	M2.02	U
IX	Draw a neat diagram of Babcock and Wilcox boiler and mark all parts.	M3.05	U
<b>OR</b>			
X	With the help of a neat diagram explain the principle of reaction steam turbine.	M3.06	U
XI	With neat sketch explain the working of economizer of a boiler.	M3.05	U
<b>OR</b>			
XII	With neat sketch explain the working of water level indicator of a boiler.	M3.05	U
XIII	With neat line diagram explain about shell and tube type heat exchanger.	M4.05	U
<b>OR</b>			
XIV	It is desired to cool oil from 120°C to 50°C using a double pipe heat exchanger. The cooling water enters the heat exchanger at 20°C and leaves it at 40°C. Calculate the LMTD for (i) a parallel flow heat exchanger, and (ii) for a counter flow heat exchanger.	M4.05	A

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