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**DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/MANAGEMENT/
COMMERCIAL PRACTICE, APRIL – 2025**

THERMAL ENGINEERING

[Maximum marks: 75]   [Time: 3 Hours]

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

PART A

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

(9 x 1 = 9 Marks)

		Module outcome	Cognitive level
1	Name the thermodynamic system with exchange of energy and matter with the surrounding.	M1.02	R
2	Define the term extensive property with an example.	M1.02	R
3	Write the expression to find the air standard efficiency of Otto cycle.	M2.01	R
4	Define the term brake power.	M2.05	R
5	The opening and closing of valves in an IC engine in relation to the movement of piston is called………..	M2.04	U
6	The heating of dry and saturated steam above the saturation temperature is known as………..	M3.02	R
7	The SI unit of coefficient of thermal conductivity is……	M4.01	R
8	Write the mathematical expression for Stefan-Boltzmann law.	M4.03	R
9	Define the term grey body.	M4.03	R

PART B

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

(8 x 3 = 24 Marks)

		Module outcome	Cognitive level
1	Derive Mayors relation from first law of thermodynamics.	M1.05	A
2	State and explain Joule's law.	M1.05	R
3	Derive the expression for air standard efficiency for Otto cycle.	M2.01	A
4	Compare 2 stroke petrol engine with 4 stroke petrol engine.	M2.02	R
5	Write the principle of Heat balance test.	M2.06	R

		Module outcome	Cognitive level
6	An internal combustion engine take in a mixture of fuel and air at 27^0C and highest temperature after combustion is 377^0C. Calculate the Carnot efficiency of an engine working between these two limits of temperature.	M2.03	A
7	A superheated steam at 48.263 bar and 359.99^0C is expanded at constant entropy to 9.65 bar. Determine the change in enthalpy.	M3.04	U
8	Define the following terms (a) Absorptivity (b) Emissivity (c) Reflectivity	M4.03	R
9	Compare free with forced convention heat transfer.	M4.04	R
10	Explain the working of counter flow heat exchangers.	M4.05	U

PART C
Answer all questions. Each question carries seven marks
(6 x 7 = 42 Marks)

		Module outcome	Cognitive level
III	Explain the following terms in the context of thermodynamics. (a) System (b) Surroundings (c) Universe (d) State (e) Properties.	M1.02	R
	OR		
IV	What is adiabatic process? Derive an expression for the work done during adiabatic expansion for an ideal gas.	M1.04	U
V	A quantity of gas occupying $0.1m^3$ at 0.8 MPa is heated at constant pressure until volume becomes $0.2m^3$. The initial temperature is 197^0C and $C_p = 1.005$kJ/kg.K and $C_v = 0.718$ kJ/kg.K. Find the change in internal energy.	M1.05	U
	OR		
VI	Show that, for a constant volume heating, the supplied to the gas is equal to change of internal energy.	M1.05	U

VII	A Carnot engine is operated between two reservoirs at temperatures of 377^0C and 37^0C. If the engine receivers 290 kJ of heat form the source in each cycle, calculate.
	  (i) Amount of heat rejected to the sink in each cycle.
	  (ii) Efficiency of the engine, and
	  (iii) Work done by the engine in each cycle.
		M2.03	U

	OR		
VIII	Explain Morse test for determining frictional power of engine.	M2.06	R

IX	Determine the following properties of liquid & steam at pressure of 10 bar as given below.
	
	    (i) Saturation temperature
	    (ii) Specific enthalpy of liquid.
	    (iii) Specific enthalpy of dry saturated steam.
		M3.04	U

	OR		
X	Briefly Explain the working of Reaction steam turbine.	M3.06	U
XI	What are boiler mountings? List out at least 4 boiler mountings and its functions.	M3.05	R
	OR		
XII	Explain about the advantages of water tube boilers over fire tube boiler.	M3.05	U
XIII	With suitable sketches explain the working of Shell and Tube heat exchanger.	M4.05	U
	OR		
XIV	Explain the working of any two rotary air compressors.	M4.07	U

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