Hall Ticket Number:

Code No. : 12527 N/O

VASAVI COLLEGE OF ENGINEERING *(AUTONOMOUS)*, HYDERABAD

Accredited by NAAC with A++ Grade

B.E. (Mech. Engg.) II-Semester Main & Backlog Examinations, August-2023

Thermodynamics

Time: **3 hours** Max. Marks: **60**

*Note: Answer all questions from **Part-A** and any **FIVE** from **Part-B***

Part-A (10× 2 = 20 Marks)

Q. No.	Stem of the question	M	L	CO	PO
1.	Discuss the approach of control mass and control volume for understanding the system.	2	1	1	1
2.	Explain the importance and applications of thermodynamic cycle.	2	2	1	1
3.	Differentiate between specific heat and specific enthalpy of the substance.	2	2	2	1
4.	Why the energy is conservative? Justify.	2	1	2	1
5.	What do you understand by the principle of entropy increase?	2	2	3	1
6.	Explain the irreversible process in comparison with reversible process.	2	2	3	1
7.	What is the significance of h-s chart?	2	1	4	1
8.	Represent the phase change process on p-T diagram.	2	2	4	1
9.	Draw p-v and T-s diagrams for Brayton cycle.	2	2	5	1
10.	Define air standard efficiency and discuss.	2	1	5	1
	Part-B (5×8 = 40 Marks)				
11. a)	Differentiate between microscopic and macroscopic approach of thermodynamics	3	2	1	1
b)	A new scale "N" of temperature is divided in such a way that the freezing point of ice is 100°N and boiling point is 400°N. What is the temperature reading on this new scale when the temperature is 150°C? At what temperature both the Celsius and the new temperature scale readings would be the same?	5	3	2	2
12. a)	How to make use of steady flow energy equation? Discuss few applications.	3	2	2	1
b)	The properties of a system during constant pressure non flow process at P = 1.6 bar, change from v_1 = 0.3 m^3/kg, T_1 = 20°C to v_2 = 0.55 m^3/kg, T_2 = 260°C. Then determine (i) heat added per kg (ii) work done per kg (iii) change in internal energy per kg. Assume C_p =1.005 kJ/kg K and C_v = 0.718 kJ/kg K.	5	3	2	2

Contd... 2

13. a)	State and explain Kelvin Planck statement of second law of thermodynamics	3	2	3	1
b)	A reversible heat engine operates between two reservoirs at temperatures of 600 ^{0}C and 40^{0}C. The engine drives a reversible refrigerator which operates between reservoirs at temperatures of 40°C and 20°C. The heat engine is 2000 kJ and the net work output of the combined engine refrigerator plant is 360 kJ. Then evaluate the heat transfer to the refrigerant and the net heat transfer to the reservoir at 40°C.	5	3	3	2
14. a)	Explain the importance of triple point of water and show it on T-v diagram	3	2	4	1
b)	Steam initially at 15 bar pressure and 300°C is expanded isentropically in a turbine to a pressure of 1 bar. Determine (i) the change in enthalpy and (ii) the exit condition of the steam. Use Mollier diagram.	5	3	4	2
15. a)	Derive the air standard efficiency of a Otto cycle.	4	2	5	1
b)	A gas engine working on Otto cycle has a cylinder of diameter 220 mm and stroke 300 mm. The clearance volume is 1800 CC. Find the air-standard efficiency and mean effective pressure. Assume C_p =1.004 kJ/kg K and C_v = 0.718 kJ/kg K for air.	4	3	5	2
16. a)	What do you understand by intensive and extensive properties? Explain them with suitable examples.	4	1	1	1
b)	Prove that the internal energy is a property of the system.	4	2	2	1
17.	Answer any ***two*** of the following:				
a)	One kg of gas heated from a temperature of 100°C at constant volume till its pressure becomes three times to its original pressure. Calculate the change in entropy. Assume C_v= 0.718 kJ/kg K.	4	3	3	2
b)	What is pure substance? Explain the method to estimate the properties of pure substance during phase change.	4	2	4	1
c)	Draw P-h and T-s diagrams for Rankine cycle and derive the equation for its efficiency	4	2	5	1

M : Marks; L: Bloom's Taxonomy Level; CO; Course Outcome; PO: Programme Outcome

i)	Blooms Taxonomy Level – 1	20%
ii)	Blooms Taxonomy Level – 2	38.75%
iii)	Blooms Taxonomy Level – 3 & 4	41.25%

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