Hall Ticket Number:

Code No. : 12514 N

VASAVI COLLEGE OF ENGINEERING *(AUTONOMOUS)*, HYDERABAD

Accredited by NAAC with A++ Grade

B.E. (Mech. Engg.) II-Semester Main & Backlog Examinations, September-2022

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.	Explain the significance of thermal equilibrium in formulation of Zeroth law of thermodynamics.	2	2	1	1
2.	Enumerate the importance of quasi static process.	2	1	1	1
3.	Apply the first law of thermodynamics to a cycle and write corresponding equation.	2	1	2	1
4.	Discuss the significance of Perpetual Motion Machine of first kind.	2	2	2	1
5.	Define the terms Exergy and Anergy.	2	1	3	1
6.	State the principle of increase of entropy.	2	1	3	1
7.	Explain the concept of phase change and why pressure and temperature are constant during phase change?	2	2	4	1
8.	What is Mollier chart? Discuss its application.	2	2	4	1
9.	Represent "Dual combustion cycle" on P-V and T-S planes.	2	1	5	1
10.	What is cut off ratio? What is its influence on efficiency of diesel cycle?	2	2	5	1
	Part-B (5×8 = 40 Marks)				
11. a)	What is principle of thermometry? How could it help in designing the measurement of temperature? Explain.	3	2	1	1
b)	It is decided to form a new temperature scale Z is to be formulated. The freezing temperature and boiling temperatures of water on this new scale are 100^0Z and 400^0Z respectively. Then (i) what will be the readings on new scales corresponding to 40^0C and 80^0C and (ii) At what temperatures both the Celsius and new temperature scale would read same temperature?	5	4	1	2
12. a)	Show that the internal energy is a point function and heat and work transfers are path functions.	4	2	2	1
b)	A stationary mass of gas is compressed without friction from an initial state of 0.3 m^3 and 0.105 MPa to a final state of 0.15 m^3 and 0.105 MPa, the pressure remaining constant during the process. There is a 37.6 kJ of heat rejected from the gas during the process. How much does the internal energy of the gas change?	4	3	2	2

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13. a)	Explain the significance of Claussius inequality.	3	1	3	1
b)	A reversible heat engine operates between 875 K and 310 K and drives a reversible refrigerator operating between 310 K and 255 K. The engine receives 2000 kJ of heat and the net work output from the arrangement equals to 350 kJ. Calculate the cooling effect of refrigerator.	5	4	3	2
14. a)	Draw h-s and T-v diagrams for steam during phase change process and explain the salient points.	3	3	4	1
b)	Steam initially at a pressure of 15 bar 0.9 dry throttled to a pressure of 1.5 bar. Find the final condition of steam and also calculate the change of entropy per kg of steam. Assume C_p for super heated steam = 2.1 kJ/kg K.	5	3	4	2
15. a)	Draw P-V and T-S diagrams for Otto cycle and derive the equation for air standard efficiency.	4	3	5	1
b)	The volume ratios of compression and expansion for a diesel engine are 15.3 and 7.5, respectively. The pressure and temperature at the beginning of the compression are 1 bar and 27^0C. Assuming an ideal engine, determine the cycle efficiency.	4	4	5	2
16. a)	Distinguish between macroscopic and microscopic approaches of Thermodynamics.	4	1	1	1
b)	Derive the steady flow energy equation in terms of kJ/kg and discuss salient points.	4	2	2	1
17.	Answer any ***two*** of the following:				
a)	Show that the Kelvin-Planck statement and Clausius statement are the same.	4	3	3	1
b)	5 kg of steam with a dryness fraction of 0.9 expands adiabatically according to the law $PV^{1.13} = C$ from a pressure of 8 bar to 1.5 bar. Determine (i) final dryness fraction, (ii) heat transferred and (iii) work done.	4	4	4	2
c)	Compare and contrast Otto cycle with Brayton cycle for same compression process.	4	2	5	1

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

i)	Blooms Taxonomy Level – 1	21.25%
ii)	Blooms Taxonomy Level – 2	31.25%
iii)	Blooms Taxonomy Level – 3 & 4	47.5%

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