Hall Ticket Number:

Code No. : 13568 AO

VASAVI COLLEGE OF ENGINEERING *(AUTONOMOUS)*, HYDERABAD

Accredited by NAAC with A++ Grade

B.E. (Mech. Engg.) III-Semester Backlog Examinations, Jan./Feb.-2024

Applied 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.	What are the advantages of multistage compressor over single stage air compressor?	2	1	1	1
2.	Define the terms "mechanical efficiency" and "isothermal efficiency" as referred to reciprocating air compressor.	2	1	1	1
3.	Define brake specific fuel consumption for an IC engine.	2	1	2	1
4.	Show the valve openings and closings on actual valve timing diagram of a 4 stroke SI engine.	2	1	2	1
5.	Define Octane number.	2	1	3	1
6.	How does IC engine exhaust contribute to air pollution? What are the main pollutants in it?	2	1	3	1
7.	How does Rankine cycle differ from a Carnot vapour cycle?	2	4	4	1
8.	Define the terms boiler mountings and accessories and give one example for each.	2	1	4	1
9.	Define the term critical pressure ratio for a steam nozzle.	2	1	5	1
10.	How jet condensers differ from surface condensers?	2	4	5	1
	Part-B (5 × 8 = 40 Marks)				
11. a)	Briefly explain the working of a single stage single-acting reciprocating air-compressor with a neat sketch.	4	2	1	1
b)	A two-stage single acting reciprocating air compressor takes in air at the rate of 0.2 m^3/s. The intake pressure and temperature of air are 100 kPa and 16°C. The air is compressed to a final pressure of 700 kPa. The compression index in both the stages is 1.25. Determine (i) the intermediate pressure if the inter cooling is perfect and (ii) the power required to drive the compressor.	4	3	1	2
12. a)	Explain the working principle of four stroke spark ignition engine with neat sketches.	4	2	2	1
b)	A six cylinder, four stroke petrol engine having a bore of 90 mm and stroke of 100 mm has a compression ratio of 7. The relative efficiency with reference to indicated thermal efficiency is 55 % when the fuel consumption is 20.52 kg/h. Estimate the calorific value of the fuel, given that the indicated mean effective pressure is 8.5 bar and speed is 2500 rpm.	4	3	2	2

Contd... 2

13. a)	Discuss about the stages of combustion in S.I. engine using a pressure-crank angle diagram.	4	2	3	1
b)	Briefly discuss the influence of the inlet temperature, pressure, self-ignition temperature of the fuel and compression ratio on the knocking phenomenon in SI and CI engines.	4	3	3	1
14. a)	A steam turbine receives steam at 15 bar and 350°C, and exhausted to the condenser at 0.06 bar. Determine the thermal efficiency of the ideal Rankine cycle operating between these two limits.	4	3	4	2
b)	Describe the working principle of Cochran boiler with a neat sketch.	4	2	4	1
15. a)	Dry saturated steam at a pressure of 8 bar enters a convergent-divergent nozzle and leaves it at a pressure of 1.5 bar, if the flow is isentropic and the corresponding expansion index is 1.135; find the ratio of exit area to the throat area of the nozzle for maximum discharge.	4	3	5	2
b)	With pertinent sketch explain the working of any one type of jet condenser.	4	2	5	1
16. a)	Plot the compression process on P-V and T-S planes and obtain the expression for work required by the single stage single acting reciprocating air compressor without considering clearance volume.	4	3	1	2
b)	Distinguish between 2-stroke and 4-stroke engines by mentioning at least four differences.	4	4	2	1
17.	Answer any ***two*** of the following:				
a)	Discuss briefly about the types of combustion chambers used in SI engines.	4	2	3	1
b)	Distinguish between fire-tube and water-tube boilers.	4	4	4	1
c)	Explain the working principle of a cooling tower.	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	35%
iii)	Blooms Taxonomy Level – 3 & 4	45%

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