VASAVI COLLEGE OF ENGINEERING *(AUTONOMOUS)*, HYDERABAD
Accredited by NAAC with A++ Grade
B.E. (Mech. Engg.) IV-Semester Main & Backlog Examinations, July-2022
Applied Thermodynamics

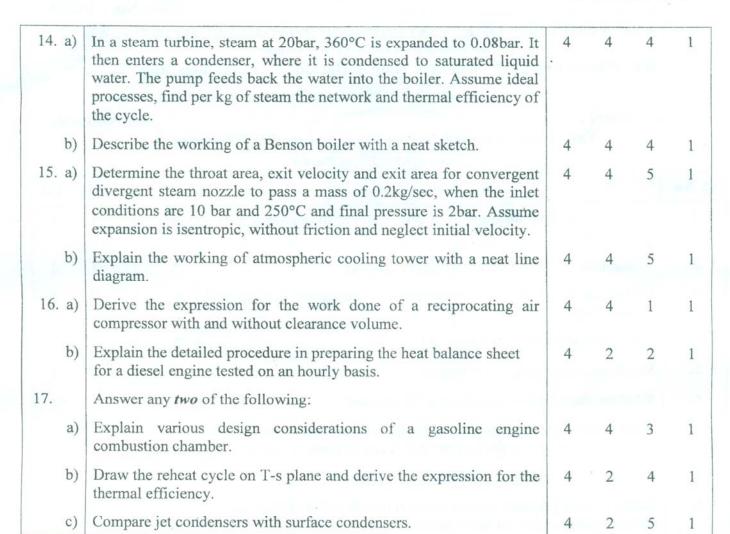Time: **3 hours**   Max. Marks: **60**

*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.	Draw energy flow diagram from prime mover to compressor in a compressor.	2	1	1	1
2.	Distinguish between intercooler and aftercooler.	2	1	1	1
3.	Define brake specific fuel consumption and indicated specific fuel consumption.	2	1	2	1
4.	Write the significance of Morse test.	2	2	2	1
5.	Sketch motoring curve on P-θ plane.	2	1	3	1
6.	What are the effects of knocking in SI Engines?	2	1	3	1
7.	What is the effect of i) increase in Boiler pressure and ii) decrease in condenser pressure on the thermal efficiency of Rankine cycle?	2	2	4	1
8.	List various boiler mountings and accessories.	2	1	4	1
9.	Define critical pressure ratio of a steam nozzle and find the value of critical pressure ratio for super-heated steam.	2	1	5	1
10.	Define condenser efficiency and vacuum efficiency.	2	1	5	1

Part-B *(5 × 8 = 40 Marks)*

		M	L	CO	PO
11. a)	Compare two stage air compressor with single stage air compressor.	4	2	1	1
b)	An air compressor is required to compress air from a pressure of 1 bar to 12 bar. Calculate the amount of work required per kg of air when n=1.25 for compression. Assume initial temperature as 25°C and R for air is 0.287kJ/kg-K.	4	4	1	1
12. a)	Explain working of a four-stroke diesel engine with a neat sketch during each stroke.	4	2	2	1
b)	A four-cylinder petrol engine has an output power of 52kW, indicated power of 63.77kW, fuel consumption of 19.03kg/hr, air consumption of 182.63kg/hr, calorific value of 44000kJ/kg find i) Mechanical efficiency ii) Brake thermal efficiency iii) Air fuel ratio.	4	4	2	1
13. a)	Illustrate different stages of combustion process in CI Engine with the help of pressure -crank angle plane.	5	2	3	1
b)	List and sketch various combustion chambers used in gasoline engines.	3	2	3	1

			M	L	CO	PO
14.	a)	In a steam turbine, steam at 20bar, 360°C is expanded to 0.08bar. It then enters a condenser, where it is condensed to saturated liquid water. The pump feeds back the water into the boiler. Assume ideal processes, find per kg of steam the network and thermal efficiency of the cycle.	4	4	4	1
	b)	Describe the working of a Benson boiler with a neat sketch.	4	4	4	1
15.	a)	Determine the throat area, exit velocity and exit area for convergent divergent steam nozzle to pass a mass of 0.2kg/sec, when the inlet conditions are 10 bar and 250°C and final pressure is 2bar. Assume expansion is isentropic, without friction and neglect initial velocity.	4	4	5	1
	b)	Explain the working of atmospheric cooling tower with a neat line diagram.	4	4	5	1
16.	a)	Derive the expression for the work done of a reciprocating air compressor with and without clearance volume.	4	4	1	1
	b)	Explain the detailed procedure in preparing the heat balance sheet for a diesel engine tested on an hourly basis.	4	2	2	1
17.		Answer any *two* of the following:				
	a)	Explain various design considerations of a gasoline engine combustion chamber.	4	4	3	1
	b)	Draw the reheat cycle on T-s plane and derive the expression for the thermal efficiency.	4	2	4	1
	c)	Compare jet condensers with surface condensers.	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	40%
iii)	Blooms Taxonomy Level – 3 & 4	40%

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