Code No.: 14568 O

## VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS), HYDERABAD Accredited by NAAC with A++ Grade

## B.E. (Mech. Engg.) IV-Semester Backlog Examinations, July/August-2023 Applied Thermodynamics

Time: 3 hours

Max. Marks: 60

Note: Answer all questions from Part-A and any FIVE from Part-B Use of steam tables and mollier chart is permitted

Part-A  $(10 \times 2 = 20 Marks)$ 

+	Stem of the question	1			
1.	List different applications of reciprocating air compressors.	- IN	1 L	CC	)
2.	Write the need of inter cooling in multi stage reciprocating air compressors.  Draw the actual the second stage reciprocating air compressors.	2	! 1	1	
3.	Draw the actual thermodynamic cycle for petrol engine on P-v Plane and indicate the processes.	i. 2		y d	
4.	What is the influence of specific fuel consumption on brake power of the		2	2	
<ol> <li>5.</li> <li>6.</li> </ol>	What is ignition delay? How it influences the performance?	2	2		
7.	Explain the influence of pre-combustion in C I engine combustion chamber.  Draw the modified Rankine cycle on T-s plane.	2	3	3	1
8.	Write the advantages of fluidized bed combustion boiler over conventional pulverized boiler.	2	2	4	1
9.	Derive the equation for estimation of exit velocity of nozzle based on steady flow energy equation.	2	3	5	1
-	Why the cooling towers are required for steam power plants?	2	2	5	1
	Part-B $(5 \times 8 = 40 Marks)$				1
	Derive the equation for work required to compression of single acting eciprocating air compressor with clearance volume.	4	2	1	1
b) A a c th	It two stage air compressor with perfect inter cooling takes in air at 1 bar and 300 K. The law of compression in both the stages is $PV^{1.3} = C$ . The compressed air delivered at 9 bar. Calculate for unit mass flow rate of air, alues if compression is carried out in single stage compressor.	4	3	1 2	2
a) Do	escribe the working principle of four stroke S I Engine with a suitable	olem Lagra	2 2	2 1	

b)	In a test of a four-cylinder, four-stroke petrol engine of 75 mm bore and 100 mm stroke, the following results were obtained at full throttle at a constant speed and with a fixed setting of the fuel supply of 0.082 kg/min.	4	4	2	2
	bp with all cylinders working = 15.24 kW				
ţ	bp with cylinder number 1 cut-off = 10.45 kW				
=	bp with cylinder number 2 cut-off = 10.38 kW				
	bp with cylinder number 3 cut-off = 10.23 kW				
	bp with cylinder number 4 cut-off = 10.45 kW				
	Estimate the indicated power of the engine under these conditions. If the calorific value of the fuel is 44 MJ/kg, find the indicated thermal efficiency of the engine.				
13. a)	Draw p-O diagram for S I Engine and explain different stages of combustion	4	2	3	1
b)	Differentiate between knocking phenomena of S I Engine and C I Engine	4	2	3	1
14. a)	Draw the schematic diagram of Cochran boiler and explain the principle of operation.	4	2	4	1
b)	Compare Fire tube boilers with water tube boilers.	4	4	4	1
15. a)	Explain the principle of operation of counter flow jet condenser along with its advantages and limitations.	4	1	5	1
b)	Steam at an initial pressure of 7 bar and in dry saturated condition flows through a convergent divergent nozzle having a throat area 3.5 sq. cm. The pressure at exit plane is 1.4 bar and the exit velocity is 700 m/s. The flow from nozzle entrance to throat is reversible and adiabatic. Determine the exit area of the nozzle and nozzle overall efficiency.	4	2	5	2
16. a)	Explain the working of a two stage air compressor with a line diagram and P-v plane.	4	2	1	1
b)	Discuss in detail the heat balance test.	4	1	2	1
17.	Answer any two of the following:				
a)	Explain the effect of engine variables on knocking on C I engine.	4	1	3	1
b)	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	4	2	4	1
c)	Derive the equation for the estimation of critical pressure ratio in terms of index of expansion for convergent divergent nozzle.	4	2	5	1

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

(i	Blooms Taxonomy Level – 1	22.5%
ii)	Blooms Taxonomy Level - 2	57.5%
iii)	Blooms Taxonomy Level - 3 & 4	20%