Q. Code: 914093

Reg. No. | | | | | | | | | |

B.E. / B.TECH. DEGREE EXAMINATIONS, DEC 2019

Second Semester

MR16201 – MARINE ENGINEERING THERMODYNAMICS

(Marine Engineering)

(Regulation 2016)

Time: Three Hours **Maximum : 100 Marks**

(Use of Steam Tables and Mollier diagram are permitted)

Answer **ALL** questions

PART A - (10 X 2 = 20 Marks)

		CO	RBT
1.	Distinguish between open, close and isolated systems.	1	U
2.	State first law of thermodynamics applied to a closed system.	1	AP
3.	What do you understand by the term "Entropy"?	2	U
4.	State Clausius statement of second law of thermodynamics.	2	U
5.	Show Rankine cycle indicating its processes on a T-s diagram.	3	AP
6.	Define the term "Sensible heat ".	3	U
7.	Indicate the processes of Diesel cycle on p-v diagram.	4	AP
8.	Define "Clearance volume " of an engine.	4	U
9.	What is meant by "excess air" in combustion of a fuel?	5	R
10.	Define "Heating value" of a fuel.	5	R

PART B - (5 X16 = 80 Marks)

11.	(a)	(i)	Explain isothermal process and also derive an equation for the work done during isothermal process.	(8)	1	AP
		(ii)	State and apply first law of thermodynamics to a closed system with an example.	(8)	1	AP
			(OR)			
	(b)		A fluid system undergoes a non uniform frictional process following the pressure volume relation as P = (5/V) + 1.5, where P is in bar and V is in m^3. During the process the volume changes from 0.15 m^3 to 0.05m^3 and the system rejects 45 kJ of heat. Determine i. Change in Internal Energy and ii. Change in Enthalpy.	(16)	1	AP

12.	(a)	(i)	Differentiate Heat Engine, Refrigerator and Heat Pump in all aspects with block diagram. Also derive expressions for their efficiency and CoP in terms of temperature limits.	**(10)**	**2**	**AP**
		(ii)	Briefly explain the term "Available Energy".	**(6)**	**2**	**AP**
			(OR)			
	(b)		300 kJ/s of heat is supplied at a constant fixed temperature of 290 °C to a heat engine. The heat rejection takes place at 8.5 °C. Classify the following cases as a reversible, irreversible or impossible cycle. i. 215 kJ/s heat rejected, ii. 150 kJ/s heat is rejected and iii.75 kJ/s heat is rejected.	**(16)**	**2**	**AP**
13.	(a)		In a steam power cycle, the steam supply is at 15 bar and dry and saturated. The condenser pressure is 0.4 bar. Calculate the Carnot and Rankine efficiencies of the cycle.	**(16)**	**3**	**AP**
			(OR)			
	(b)		Show Rankine cycle on T-s diagram and derive an expression for cycle efficiency. Also describe the methods of improving thermal efficiency of Rankine cycle.	**(16)**	**3**	**AP**
14.	(a)		Explain Otto Cycle with P-v and T-s diagram and derive an expression for its cycle efficiency.	**(16)**	**4**	**AP**
			(OR)			
	(b)		Derive an expression for thermal efficiency of a Diesel cycle and also explain working of Diesel cycle with appropriate diagrams.	**(16)**	**4**	**AP**
15.	(a)		Derive Maxwell relations.	**(16)**	**5**	**AP**
			(OR)			
	(b)	(i)	Explain HCV and LCV and state the difference between them.	**(8)**	**5**	**AP**
		(ii)	Briefly explain Joule Thomson Coefficient.	**(8)**	**5**	**AP**