QP Code: RD21BTECH059 | Reg. No | | | | | | | | | | | AR 21

GIET UNIVERSITY, GUNUPUR – 765022

B. Tech (Third Semester - Regular) Examinations, December – 2022

21BMEPC23001 – Engineering Thermodynamics

(Mechanical Engineering)

Time: 3 hrs | Maximum: 70 Marks

Answer ALL questions

(The figures in the right hand margin indicate marks)

PART – A **(2 x 5 = 10 Marks)**

		CO #	Blooms Level
Q.1.	Answer ***ALL*** questions		
a.	Define Availability.	CO1	PO1
b.	State the different alternative options to improve Rankine cycle efficiency.	CO2	PO1
c.	Distinguish between petrol and diesel engine.	CO2	PO1
d.	State required qualities for a good refrigerant.	CO3	PO1
e.	Write down the uses of compressed air?	CO4	PO1

PART – B **(15 x 4 = 60 Marks)**

	Answer ***ALL*** the questions	Marks	CO #	Blooms Level
2. a.	Give the expression for the entropy generation rate for a control volume of a steady flow system.	5	CO1	PO2
b.	A rigid vessel of volume 0.86 m^3 contains 1 kg of steam at a pressure of 2 bar. Calculate the specific volume, temperature, dryness fraction of steam and enthalpy.	10	CO1	PO2
	(OR)			
c.	Illustrate the phase equilibrium diagram for a pure substance on h-s plot with relevant constant property lines.	5	CO1	PO2
d.	5 kg of saturated liquid water at 1 bar is heated at constant pressure until the temperature becomes 200 ^oC. Calculate i. Work done ii. Heat transfer	10	CO1	PO2
3.a.	Explain Regenerative cycle with appropriate diagrams.	5	CO2	PO2
b.	Steam at 20 bar, 360 ^oC is expanded in a steam turbine to 0.08 bar. It then enters a condenser, where it is condensed to saturated liquid water. The pump feeds back the water into the boiler. Find per kg of steam the net work and the cycle efficiency.	10	CO2	PO2
	(OR)			
c.	Describe binary vapour power cycle with a neat sketch.	5	CO2	PO2
d.	In a reheat cycle, the initial steam pressure and the maximum temperature are 150 bar and 550°C respectively. If the condenser pressure is 0.1 bar and the moisture at the condenser inlet is 5%, and assuming ideal processes, determine (a) the reheat pressure, (b) the cycle efficiency, and (c) the steam rate.	10	CO2	PO2
4.a.	For the same compression ratio and heat rejection, which cycle is most efficient otto, diesel, and dual? Explain with	5	CO3	PO1

b.	In air standard Otto cycle the compression ratio is 7, and compression begins at 35^{o}C, 0.1MPa. The maximum temperature of the cycle is 1100^{o}C. Estimate (a) the heat supplied per kg of air (b) the work done per kg of air (c) the cycle efficiency (d) the m. e. p. of the cycle.	10	CO3	PO2
	(OR)			
c.	With neat sketch, describe the working principle of a vapour compression refrigeration cycle.	5	CO3	PO1
d.	Derive the expression of Diesel Cycle efficiency.	10	CO3	PO2
5.a.	Classify and state different types of Air compressors.	5	CO4	PO1
b.	Derive the expression of workdone for a single stage air compressor without clearance volume.	10	CO4	PO2
	(OR)			
c.	Describe multistage compression with an appropriate diagram and state its advantages.	5	CO4	PO1
d.	An air compressor cylinder has 15 cm bore diameter, 15 cm stroke and 5% clearance. The compressor operates between 110 kPa, 27 ^{o}C and 500 kPa. The polytropic index is 1.3. Calculate cylinder volume at each point in p-v diagram, (b) flow capacity in m^3/min at 720 rpm, (c) volumetric efficiency, (d) mean effective pressure.	10	CO4	PO2

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