QP Code:RD22BTECH053 Reg. No | | | | | | | | | | AY 22

GIET UNIVERSITY, GUNUPUR – 765022

B. Tech (Third Semester Regular) Examinations, December – 2023

22BMEPC23001 – Engineering Thermodynamics

(Mechanical)

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)**

Q.1. Answer ***ALL*** questions	CO #	Blooms Level
a. Define dryness fraction. What is the value of dryness fraction for dry steam?	CO1	K2
b. Calculate the enthalpy of 1kg steam at a pressure of 8 bar and dryness fraction 0.8. How much heat would be required to raise the 2kg of this steam from water at 20^0C?	CO1	K3
c. Draw the T-s and P-V diagram of a Reheat-Rankine cycle.	CO2	K2
d. Find out the efficiency of the diesel cycle have compression ratio and cut off ratio of 16 and 6 respectively.	CO3	K2
e. Describe swept volume and clearance factor.	CO4	K2

PART – B **(15 x 4 = 60 Marks)**

Answer ***ALL*** questions	Marks	CO #	Blooms Level
2. a. A rigid closed tank of volume 3 m^3 contains 5 kg of wet steam at a pressure of 200 kPa. The tank is heated until the steam becomes dry saturated. Determine the final pressure and the heat transfer to the tank.	10	CO1	K2
b. Describe P-V and T-S diagram of reheat Rankine cycle.	5	CO1	K2
(OR)			
c. 10 kg of saturated liquid water at 1bar is heated at constant pressure until the temperature becomes 200 °C. Calculate: (i) The initial and final volumes (ii) The work done (iii) The heat transfer	10	CO1	K2
d. Explain water to steam conversion process in a T-S diagram.	5	CO1	K2
3.a. Steam enters the high pressure turbine of a reheat cycle at 10 bar and 500°C. The reheat temperature and pressure are 450°C and 5 bar respectively. The turbine and pump efficiency are 90% and 85%°C respectively. Find the efficiency of reheat cycle, if condenser pressure is 0.4 bar.	10	CO2	K3
b. Explain Feed Water Heater.	5	CO2	K2
(OR)			
c. A steam power plant operates between a boiler pressure of 4MPa 300 °C and a condenser pressure of 50 KPa. Determine the thermal efficiency of the cycle.	10	CO2	K3
d. Explain the impact of mean temperature of heat addition.	5	CO2	K2
4.a. An engine working on the Otto cycle is supplied with air at 0.1 MPa, 35 °C. The compression ratio is 8. Heat supplied is 2100 kJ/kg. Calculate the maximum pressure and temperature of the cycle, the cycle efficiency and the	10	CO3	K3

	mean effective pressure.			
b.	Explain reverse Brayton Cycle.	5	CO3	K2
	(OR)			
c.	An air standard limited pressure cycle has a compression ratio of 15 and compression begins at 0.1 MPa, 40°C. The maximum pressure is limited to 6 MPa and the heat added is 1.675 MJ/kg. Compute (i) the heat supplied at constant volume per kg of air, (ii) the heat supplied at constant pressure per kg of air (iii) the work done per kg of air (iv) the cycle efficiency (v) the temperature at the end of the constant volume heating process, (vi) the cut-off ratio and (viii) the m.e.p. of the cycle.	10	CO3	K3
d.	Explain vapour compression cycle.	5	CO3	K2
5.a.	A 2 stage air compressor with perfect intercooling takes air at 1 bar 27 ^{o}C. The compression takes place pollytropically in both stages having n = 1.3. The compressed air is delivered at 9 bar from the high pressure compressor. Calculate (i) minimum work done per kg of air. (ii) heat rejected in the intercooler per kg of air.	10	CO4	K3
b.	Prove that the optimum intermediate intercooler pressure is the square root of inlet pressure and delivery pressure of a 2 stage air compressor.	5	CO4	K2
	(OR)			
c.	Find the stroke, piston diameter and indicated power of a single acting air compressor which operates under following conditions: Volume of free air delivered at 101kPa and 15^{o}C is 105m^{3}/min; Pressure and temperature at the beginning of compression are 98kPa and 30 ^{o}C , discharge pressure is 40kPa, Speed at 220 rpm, n = 1.25, stoke = bore, clearance volume= 6% of swept volume.	10	CO4	K3
d.	Classify Compressor with respect to different description.	5	CO4	K2

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