G.R. No.

Paper code - U239-154 (T1)

OCTOBER 2019 INSEM (T1)
S. Y. B.TECH. (MECHANICAL) (SEMESTER – III)
COURSE NAME: THERMODYNAMICS
COURSE CODE: MEUA21184
(PATTERN 2018)

[Max. Marks: 20]

Time: [1 Hour]

(*) Instructions to candidates:
1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Use of scientific calculator is allowed.
4) Assume suitable data where ever required.

Q. 1) Attempt any **one**
a) What are the similarities and dissimilarities between heat and work? [4+4]
By applying SFEE, show that $Q = h_2 - h_1$ for a boiler.

b) A fluid system contained in a piston and cylinder arrangement. It passes through a complete cycle of four processes. The sum of all heat transferred during a cycle is -400 kJ. The system completes 200 cycles per min. Complete the following table showing the method for each item and compute the net rate of work output.

Process	Q (kJ/min)	W (kJ/min)	U (kJ/min)
1-2	0	4300	---
2-3	40000	0	---
3-4	-4000	---	-73000
4-1	---	---	---

[8]

Q. 2) Attempt any **one**
a) State Kelvin Plank statement and Clausius statement of second law of thermodynamics, and establish the equivalence between them. [8]

b) Explain heat engine with neat sketch. A heat engine operates on a Carnot cycle between source and sink temperatures of 337°C and 57°C, respectively. If the heat engine receives 400kJ of heat from the source, find the efficiency, net work done and heat rejected to the sink. [8]

Q. 3) Attempt any **one** [4]
a) Prove that entropy is a point function.

b) 1 kg water at 0°C is brought into contact with a heat reservoir at 90°C. When water has reached 90°C, find entropy change of water and entropy change of the reservoir. Take Cp for water = 4.187 kJ/kg K. [4]

****