

Roll No.

Total No. of Pages : 03

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B.Tech. (ME) (Sem.-3)
BASIC THERMODYNAMICS

Subject Code : BTME305-18

M.Code : 76422

Date of Examination : 28-06-2024

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A

1. Write briefly :

- a) Do you agree with the statement that the conception of thermodynamics reversibility is purely hypothetically? Explain fully.
- b) What is thermodynamic system? Discuss its types.
- c) Define and explain "Zeroth law of thermodynamics" why it is so called?
- d) What do you mean by PMM of first kind?
- e) Distinguish between quasi static process and actual process.
- f) Write the similarities and dissimilarities between heat and work.
- g) Define mean effective pressure and comment its application in internal combustion engines.
- h) Write any four differences between Otto and Diesel cycle.
- i) What is pure substance?
- j) Explain the term dryness fraction.

SECTION-B

- To a close system 150kJ of work is supplied. If the initial volume is 0.6 m^3 and the pressure of the system changes as $p = 8-4V$, where p is in bar and V is in m^3 , determine the final volume and pressure of the system.
- In an otto cycle air at 17°C and 1 bar is compressed adiabatically until the pressure is 15bar. Heat is added at constant volume until the pressure rises to 40 bar. Calculate the air standard efficiency, the compression ratio and the mean effective pressure for the cycle. Assume $C_v = 0717$ killo joule/kg K and $R = 8.314$ kilo joule/kmol k.
- Derive an expression for the efficiency of a Carnot Cycle also explain the all four processes with the help of P-V diagram.
- Explain Kelvin - Planck statement and Clausius statement.
- Give the points of difference between a petrol engine and diesel engine.

SECTION-C

- Write a short note on :**
 - Scavenging
 - Fuel pump
 - Atomizer
 - Sparkplug.
- Steam power plant runs on a single regenerative heating process. The steam enters the turbine at 30 bar and 400°C and steam fraction is withdrawn at 5 bar. The remaining steam exhausts at 0.10 bar to the condenser. Calculate the efficiency and steam rate of the power plant. Neglect the pump works.
- The parameters of fluid at inlet and exit from the insulated Nozzle are given below :

Parameters	Inlet	Outlet
Enthalpy	2815 KJ/Kg	2660 KJ/Kg
Velocity	60 m/s	-
Area	0.1m^2	-
Specific Volume	$0.185 \text{ m}^3/\text{Kg}$	$0.495 \text{ m}^3/\text{Kg}$

Calculate :

- a) Velocity of the fluid at the exit of the Nozzle
- b) Mass flow rate of the fluid
- c) Exit area of the Nozzle
- d) Assume the Nozzle to be horizontal .

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.