

**MAHARASHTRA ANIMAL AND FISHERY SCIENCES UNIVERSITY, NAGPUR**  
**SEMESTER END THEORY EXAMINATION, B. TECH. (D. T.)**

Semester	: II (V Dean)	Academic Year	: 2021-2022
Course No.	: DE- 204	Course Title	: Thermodynamics
Credits	: (1+1=2)	Total Marks	: 50
Day & Date	: Monday, 14/11/2022	Time	: 02.30 Hrs.

- Note :**
- 1) All questions from **Section 'A'** are compulsory.
  - 2) Solve **Any Three** questions from **Section 'B'**.
  - 3) Draw neat and well labelled diagram wherever necessary.

**SECTION – 'A'**

Q. 1 A) Choose the most appropriate answer from the options given below. (05)

- i) A cycle consisting of two constant volume and two isothermal processes is known as .....
  - a) Carnot cycle
  - b) Joule's cycle
  - c) Diesel cycle
  - d) Stirling cycle
- ii) Second law of thermodynamic defines .....
  - a) Heat
  - b) Work
  - c) Entropy
  - d) Internal energy
- iii) Kelvin- Planck's law deals with .....
  - a) Conservation of work
  - b) Conservation of heat
  - c) Conservation of mass
  - d) Conservation of heat into work
- iv) The hyperbolic process is governed by .....
  - a) Boyle's law
  - b) Charle's law
  - c) Gay- Lussac law
  - d) Joule's law
- v) Properties of system which are independent of the mass are known as ..... Properties.
  - a) Extensive
  - b) Intensive
  - c) Psychometric
  - d) None of these

B) Define the following (05)

- i) Zeroth law of thermodynamics
- ii) Adiabatic process
- iii) Specific heat
- iv) Quasi-static process
- v) Swept volume

Q. 2 A) Give the reasons for the following. (05)

- i) Heat cannot be interpreted similar to temperature and pressure.
- ii) In non-flow isochoric process no work is done by the gas.
- iii) Constant pressure process is governed by Charle's law.
- iv) Efficiency of Stirling cycle is same as that of Carnot cycle.
- v) Efficiency of Joule's cycle is lower than that of Carnot cycle.

(P.T.O.)

- B) State whether the following statements are True or False. If false, rewrite the statement after making necessary corrections. (05)
- i) The specific volume is an extensive property.
  - ii) The heat and work are mutually convertible.
  - iii) The gas constant (  $R$  ) is equal to the product of two specific heats.
  - iv) The distance between TDC and BDC is known as stroke length.
  - v) Otto Cycle is also known as constant pressure cycle.

**SECTION – 'B'**

- Q. 3 A) Derive the expression for work done for non-flow constant temperature process. (05)  
B)  $0.05 \text{ m}^3$  of air at a pressure of 8 bar and temperature  $280^\circ\text{C}$  expands to 8 times its original volume and final temperature after expansion is  $25^\circ\text{C}$ . Calculate change of entropy of air during the process. Assume  $C_p = 1.005 \text{ kJ/kgK}$  and  $C_v = 0.712 \text{ kJ/kgK}$ . (05)
- Q. 4 A) Explain in brief about first law of thermodynamics and give its limitations. (05)  
B) What do you understand by enthalpy? Show that for a constant pressure process, the heat supplied to the gas is equal to the change of enthalpy. (05)
- Q. 5 A) What is thermodynamic system? Give the classification of thermodynamic system and explain any one. (03)  
B) Explain in detail about Kelvin Planck's statement. (03)  
C) The pressure of steam inside a boiler as measured by pressure gauge is  $1 \text{ N/mm}^2$ . The barometric pressure of the atmosphere is 765 mm of mercury. Find the absolute pressure of steam in  $\text{N/m}^2$ , kPa and bar. (04)
- Q. 6 A) What are the assumptions of thermodynamic cycle? Differentiate between reversible cycle and irreversible cycle. (03)  
B) What is IC engine? Give the classification of IC engines and explain in brief about two stroke IC engine. (03)  
C) A gas having initial pressure, volume and temperature as  $275 \text{ kN/m}^2$ ,  $0.09 \text{ m}^3$  and  $185^\circ\text{C}$  respectively is compressed until its temperature is  $15^\circ\text{C}$ . Calculate the amount of heat transferred and work done during the process. (04)  
(Take  $R = 290 \text{ J/kgK}$  and  $C_p = 1.005 \text{ KJ/kgK}$ .)
- Q.7 State the different types of thermodynamic cycle. Explain Carnot cycle in detail with P-V and T-S diagram. (10)

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