

2112E081

BACHELOR OF VOCATION
Solar Technology
Subject: Thermodynamics
Subject Code: ME-604
Semester: Third
December 2021
Theory (External): 70 Marks
Time: 03 Hours

Instructions to the Students

1. This Question paper consists of two Sections. All sections are compulsory.
2. Section A comprises 10 questions of objective type in nature. All questions are compulsory. Each question carries 2 mark.
3. Section B comprises 8 essay type questions out of which students need to do any 5. Each question carries 10 marks.
4. Read the questions carefully and write the answers in the answer sheets provided.
5. Do not write anything on the question paper.
6. Wherever necessary, the diagram drawn should be neat and properly labelled

Roll Number

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

specific heat of a substance. Also discuss the uses of specific heat concept in thermodynamic analysis. (05)

3. (a) By supplying energy to a dwelling at a rate of 8 kW, a heat pump maintains the temperature of dwelling at 21°C when the outside air is at 0°C. If the electricity cost is Rs.7 per kWh, then determine the minimum theoretical operating cost for each day of operation. (03)
- (b) What is the importance of Kelvin-Planck statement of the second law of Thermodynamic? How it is useful in real time thermal system design? Explain with suitable examples. (02)
4. What is triple point of water? How Degree Celsius scale of temperature measurement is developed with the help of triple point of water? Also explain the difference between triple point and critical point.
5. (a) What is Gibbs free energy? How it is calculated? What is its importance while analyzing a chemical reaction? (03)
- (b) What are the main factors responsible for irreversibility inside a thermodynamic system? How it can be estimated? What are the possible causes of irreversibility in a thermodynamic system? (02)
6. (a) What is the difference between intensive and extensive property? Explain with some suitable example. (02)
- (b) What is Zeroth law of thermodynamics? Explain its some practical uses. (03)
7. What is coefficient of performance (COP)? How it is calculated? Derive expression for calculating COP of heat pump? Insert suitable diagrams where ever required.
8. What is the difference between ideal gas and real gas? What are the commonly used mathematical equations used to analyze the behavior of ideal and real gas?

==END OF PAPER==

SECTION -A (SHORT/OBJECTIVE TYPE QUESTIONS)
(10x2=20 Marks)

- A. To obtain maximum work from an open system, all the processes must be entirely
- Irreversible
 - Reversible
 - Adiabatic
 - none of the mentioned
- B. In thermodynamics work is a
- point function
 - path function
 - depends on the state
 - none of the mentioned
- C. Work done in a quasi-static process
- depends on the path followed
 - independent of the path followed
 - depends only on the initial and final states
 - none of the mentioned
- D. A hot gas flowing through a pipeline can be considered as a
- reversible process
 - irreversible process
 - both of the mentioned
 - none of the mentioned
- E. Which of the following is a property of a pure substance?
- Constant chemical composition throughout its mass
 - it is one-component system
 - it may exist in one or more phases
 - all of the mentioned
- F. Which of the following statement is true for the Brayton cycle?
- first air is compressed reversibly and adiabatically
 - heat is added reversibly at constant pressure
 - air expands in turbine reversibly and adiabatically
 - all of the mentioned

- G. For a gas, equation of state is a functional relationship between
- Pressure
 - molar or specific volume
 - temperature
 - all of the mentioned
- H. According to Dalton's law of partial pressures, the total pressure of a mixture of ideal gases is equal to the
- difference of the highest and lowest pressure
 - product of the partial pressures of the gas constituents
 - sum of the partial pressures of the gas constituents
 - none of the mentioned
- I. If the second law of thermodynamics was not true then
- a ship could be driven by extracting heat from the ocean
 - run a power plant by extracting heat from the air
 - both of the mentioned
 - none of the mentioned
- J. Which among the following is the formula for Gibbs free energy?
- $H-T\Delta S$
 - $H-S\Delta T$
 - $\Delta H-T\Delta S$
 - $\Delta H-\Delta T\Delta S$

SECTION -B (ESSAY TYPE QUESTIONS)
(5x10=50 Marks)

- What is the difference between microscopic and macroscopic approach of thermodynamics? Explain the microscopic concept of temperature, pressure and internal energy. What are the commonly used instruments to measure temperature and pressure? Explain their working with suitable diagrams. (05)
- What is specific heat? What are the different types of the specific heats used in thermodynamics? State any procedure to measure the