

## Class Test

Academic Session: (2023-2024)

Name of Course- B.Sc. (APS) with Computer Science

Duration: 1 Hours

Semester- III

Max. marks: 16

Paper name- Heat and Thermodynamics (Theory)

Paper Code- 2222512301

Teacher's Name: Sanjesh Kumar

### **Instructions for the students:**

1. Write the Student Name, Course Name, Student College Roll Number, Paper Name and Paper Code on front page of your answer sheet.
2. This question paper contains 5 questions. All questions are compulsory and marks are indicated against each question.

Q1 Write the Maxwell's Thermodynamic relations.

4

OR

Write the Maxwell's Thermodynamic Potentials. And what is the importance of these potentials?

Q2 Draw P-V diagram for a Carnot's cycle.

2

OR

Write the differential form of First law of thermodynamics and their significance.

Q3 Explain Second law of thermodynamics and write Kelvin & Clausius statements.

5

Q4 If Gibb's potential is  $G = F + PV$  where F is the Helmholtz free energy. Then prove that

Maxwell's thermodynamical relation.  $\left(\frac{\partial V}{\partial T}\right)_P = - \left(\frac{\partial S}{\partial P}\right)_T$

3

Q5 If 115 Joules of heat are added to a gaseous system whose internal energy is 45 J, then

Find the amount of external work done?

2

## ASSIGNMENT

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Q1 What are Thermodynamic Potentials. Derive the four Maxwell's Thermodynamic relations from Them. 5

Q2 State and explain the first law of Thermodynamics. And what is its physical significance? 4

Q3 A Carnot's engine works between temperatures 727 °C and 27 °C. Find the efficiency of Engine? 2

Q4 If U & F are the internal energy & Helmholtz free energy of a system respectively. Then Prove that  $U = F - T \left( \frac{\partial F}{\partial T} \right)_V$  2

Q5 Explain entropy. And show the expression for entropy change of a perfect gas in terms of Pressure(P) and volume(V)?

$$ds = C_V \log_e \left( \frac{P_f}{P_i} \right) + C_P \log_e \left( \frac{V_f}{V_i} \right) \quad 3$$



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Duration: 1 Hour

max marks = 16

NOTE - this question paper contains 4 questions - all questions are compulsory and marks are indicated against each question.

Q1 if enthalpy is  $H = U + PV$  then find the relation

$$\left(\frac{\partial T}{\partial P}\right)_S = \left(\frac{\partial V}{\partial S}\right)_P \quad (\text{maxwell relation}) - (04)$$

Q2 Prove that  $C_p - C_v = R$  --- (04)

Q3 Prove that  $\frac{dp}{dT} = \frac{L}{T(V_2 - V_1)}$  --- (04)

Q4 if probability of the molecules in the gas between the velocity component  $v_x$  &  $v_x + dv_x$  is given by

$$P(v) dv_x =$$

$$P(v) dv_x = \left(\frac{m}{2\pi kT}\right)^{\frac{1}{2}} e^{-\frac{mv_x^2}{2kT}} dv_x$$

then find

(a)  $\langle |v_x| \rangle$  and  $\langle v_x^2 \rangle$  r.m.s.

--- (04)