Name: **Roll No.:**

Indian Institute of Technology Kanpur

Thermodynamics (ESO201A)

Semester: 2022-23-I

Quiz#2 (Set A)

Time Limit: 30 min **Full Marks: 15**

1. The compressor in a plant receives carbon dioxide at 100 kPa, 280 K, with a low velocity. At the compressor discharge, the carbon dioxide exits at 1100 kPa, 500 K, with velocity of 25 m/s and then flows into a constant-pressure aftercooler (heat exchanger) where it is cooled down to 350 K. The power input to the compressor is 50 kW. The CO_2 is treated as an ideal gas. Determine the magnitude of the rate of heat transfer from the aftercooler. State all assumptions; show a schematic diagram of the combined system showing the direction of the flow of CO_2 and the locations of the inlet and exit points, 1, 2, 3; and the control volume for the compressor and the aftercooler, respectively. Note that: $1 \rightarrow$ Inlet to the compressor, $2 \rightarrow$ Exit of the compressor, $3 \rightarrow$ Exit of the aftercooler. Data: h_1 = 198 kJ/kg, h_2 = 401.5 kJ/kg, h_3 = 257.9 kJ/kg. Use both the front and the reverse of this sheet to write your solution.

(2 + 3 + 2 + 8 = 15)