National University of Computer and Emerging Sciences, Lahore Campus

	Course:	Applied Thermodynamics	Course Code:	ME2002
	Program:	BS(Electrical Engineering)	Semester:	F 2024
	Duration:	60 Minutes	Total Marks:	40
	Paper Date:	21-Sep-24	Weight	15%
	Section:	ALL	Page(s):	4
	Exam:	Mid1 Examination	Questions	2

Name: Roll No.:   Section:

Instruction/Notes:
➤ Use valid assumptions if needed, don't ask any questions.
➤ Your answers should be correct up to three decimal places with appropriate units.
➤ Values read from tables should havè the same number of significant figures as mentioned in the tables.
➤ This is an open book, and open notes exam

CLO 1:Analyze a thermodynamics process

Q1   A closed system contains 5 kg of water in a Boiler. Initially, the water has a temperature of   **[20]** 25°C and a specific volume of $1.25616 \ m^3/kg$. The system operates in two stages:

- **Stage 1:** The system is heated until the pressure inside the boiler reaches 200 kPa keeping volume constant.
- **Stage 2:** The system is then cooled from a temperature of 150°C, allowing the pressure and temperature to change, but keeping volume constant.

a) Describe the phase and conditions of the water at $v = 1.25616 \ m3/kg$ and $T = 25^{\circ}C$?   *[handwritten: 0.0289   2-p^]*

b) When the pressure inside the boiler reaches 200 kPa, what will be the state of the water? Determine the corresponding temperature.   *[handwritten: CL   T~ 120.2]*

c) After the system cools from 150°C, what will be the total volume V of the water in the system? Describe the state of the water at this point.   *[handwritten: SV   7 4.7982]*

d) If the water is a saturated mixture of vapor and liquid, what is its quality at $T = 100^{\circ}C$? Also, illustrate this state and quality on a T−v diagram.   *[handwritten: X=0.7507]*

CLO 1:Analyze a thermodynamics process

Q2   Urea plants use ammonia as a working substance. In such a set up Ammonia is at $10^{\circ}C$ with   **[20]** mass of 300 grams in a piston cylinder with an initial volume of $0.03 \ m^3$. The piston has a design such that a pressure of 900 kPa will float it. Now the ammonia is slowly heated to $50^{\circ}C$. Identify the states involved, find the final pressure and volume and draw this entire process on a Pv diagram.

[handwritten margin: 0.1 m³/kg, 2-ph, 900 kPa, 21.48°c, $P_F = 1393.90$%]

Department of Electrical Engineering   **Applied Thermodynamics**