



**KING ABDULAZIZ UNIVERSITY.**  
**Faculty of Engineering, Rabigh Branch.**  
**Mechanical Engineering Department.**  
**Subject: Thermodynamics (I) MEP261.**  
**Fall 1432/1433 H. Final Exam.**

**Student Name:**  
**Student Number:**  
**Time: 2 hr. Group: ZA.**  
**Property Tables are allowed.**

1b) **Complete** these data for H<sub>2</sub>O: **( 6 Marks)**

| $T, ^\circ\text{C}$ | $p, \text{kPa}$ | $u, \text{kJ/kg}$ | $v, \text{m}^3/\text{kg}$ | Phase description | $x$ |
|---------------------|-----------------|-------------------|---------------------------|-------------------|-----|
|                     | 400             | 1450              |                           |                   |     |
| 220                 |                 |                   |                           | Saturated vapor   |     |
| 190                 | 2500            |                   |                           |                   |     |
|                     | 4000            | 3040              |                           |                   |     |

Sol.

*Solution: Complete the following table for H<sub>2</sub>O:*

| $T, ^\circ\text{C}$ | $P, \text{kPa}$ | $u, \text{kJ/kg}$ | Phase description        |
|---------------------|-----------------|-------------------|--------------------------|
| <i>143.61</i>       | 400             | 1450              | <i>Saturated mixture</i> |
| 220                 | <i>2319.6</i>   | <i>2601.3</i>     | Saturated vapor          |
| 190                 | 2500            | <i>805.15</i>     | <i>Compressed liquid</i> |
| <i>466.21</i>       | 4000            | 3040              | <i>Superheated vapor</i> |

**Question (2)**

**( 7 Marks)**

**2.a)** A frictionless piston–cylinder device contains 2 kg of nitrogen at 100 kPa and 300 K. Nitrogen is now compressed slowly according to the relation  $Pv^{1.4} = \text{constant}$  until it reaches a final temperature of 360 K. **Calculate** the work input during this process. **(3 Marks)**