

**KSU – Chemical Engineering Department**  
**ChE 304 (Thermodynamics) – TUT #2**

**Name:**

**ID:**

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1. Classify the following as heat or work interaction.
  - a. A gas in a piston-cylinder device is compressed, and as a result its temperature rises.
  - b. A room is heated as a result of solar radiation coming through the windows. Is this a heat or work interaction for the room?
2. At a certain location, wind is blowing steadily at 10 m/s. At that location we have a wind turbine with 60-m-diameter blades. Air density is  $1.25 \text{ kg/m}^3$ .
  - a. Calculate the kinetic energy per unit mass of the wind.
  
  
  
  
  
  
  
  
  
  
  - b. Calculate the mass flow rate of the air.
  
  
  
  
  
  
  
  
  
  
  - c. Calculate the power which can be generated from this turbine.
3. A person gets into an elevator at the lobby level of a hotel together with his 30-kg suitcase, and gets out at the 10th floor 35 m above. Determine the amount of potential energy stored in the suitcase.
4. Water is being heated in a closed pan while being stirred by a paddle wheel. During the process, 30 kJ of heat is transferred to the water, and 5 kJ of heat is lost to the surrounding air. The paddle-wheel work amounts to 0.5 kJ. Determine the final energy of the system if its initial energy is 10 kJ.