**ME 322 HOMEWORK #19
(MOCK EXAM #2)**

**Mark all correct answers. Supply supporting reasoning if you feel it is necessary.
Document all equations, conversions, and tables used in finding answers to quantitative problems.**

1- What are the fundamental units of volumetric flow rate in the mass-length-time (MLT) system?
a) L2/t
b) L3/t
c) ML/t2
d) ML3/t

2- What is the mathematical definition of the isobaric heat capacity?
a) (du/dv)T
b) (du/dT)v
c) (dh/dp)T
d) (dh/dT)p

3- In which thermodynamic state is R22 if the conditions are 10 F and 14.7 psia?
a) compressed liquid
b) two phase
c) superheated vapor
d) supercritical region

4- What information can be extracted from a pressure-volume diagram for a closed system?
a) work for any thermodynamic process
b) net work for any thermodynamic cycle
c) heat transfer for any thermodynamic process
d) net heat transfer for any thermodynamic cycle

5- What process condition(s) could apply when modeling a pump?
a) Isobaric
b) Isochoric
c) Isenthalpic
d) Isentropic

6- What process condition(s) could apply when modeling a boiler?
a) Isobaric
b) Isochoric
c) Isenthalpic
d) Isentropic
7- Which of the following statements are true along an isobar on a T-s diagram?
a) Lines slope from lower right to upper left in single phase regions.
b) Lines slope from lower left to upper right in single phase regions.
c) Lines are vertical in the two phase region.
d) Lines are horizontal in the two phase region.

8- A cogeneration turbine receives steam at 500 C and 4 MPa and exhausts steam as saturated vapor a 30 kPa. What is the specific work transfer for this device?
a) -1109 kJ/kg
b) -820 kJ/kg
c) +820 kJ/kg
d) +1109 kJ/kg

9- What specific heat transfer for a condenser that transforms saturated water vapor to saturated liquid at an operating pressure of 30 kPa?
a) -289 kJ/kg
b) -2336 kJ/kg
c) -2468 kJ/kg
d) -2625 kJ/kg

10- What is the entropy change for fluid in a system where saturated water vapor is condensed under isobaric conditions to form saturated liquid at 30 kPa?
a) -7.7695 kJ/kg-K
b) -6.8256 kJ/kg-K
c) +6.8256 kJ/kg-K
d) +7.7695 kJ/kg-K

11- In a steady flow irreversible process, the entropy of the system…
a) always increases
b) always decreases
c) always remains constant
d) can increase, decrease, or remain constant

12- What is the maximum theoretical efficiency of a powerplant with a 727 C heat source and a
27 C heat sink?
a) 0.35
b) 0.50
c) 0.70
d) 0.95
13- An insulated, rigid container is divided into two compartments separated by a partition. One compartment contains air at 15 C and .101 MPa, the other compartment contains air at 40 C and .101 MPa. When the dividing partition is removed, what happens to the total internal energy of the system?
a) it increases
b) it decreases
c) it does not change
d) it is converted to entropy

**This description applies to problems 14-17.** One pound of an ideal gas is in a closed piston/cylinder is compressed from 1 atm and 40 F to 3 atm and 540 F. For this gas, Cp = .280 Btu/lbm-R and Cv=.130 Btu/lbm-R.

14- What is the enthalpy change associated with this process?
a) 65 Btu
b)130 Btu
c) 140 Btu
d) 280 Btu

15- What is the internal energy change associated with this process?
a) 65 Btu
b) 130 Btu
c) 140 Btu
d) 280 Btu

16- What is the entropy change associated with this process?
a) 0.016 Btu/lbm-R
b) 0.021 Btu/lbm-R
c) 0.029 Btu/lbm-R
d) 0.056 Btu/lbm-R

17- What is the ratio of the final specific volume to the initial specific volume?
a) .7
b) 1.4
c) 5.6
d) 13.5

**The description below and Figure 7.25 in your text applies to problems 18-20.**On a given day, the evaporator receives heat at 30 F and the condenser rejects heat at 70F. The required heat transfer rate from the condenser to the home is 50,000 Btu/hr.
18- If the heat pump operates reversibly, what is its coefficient of performance?
a)1.8
b) 2.3
c) 11.5
d) 13.3

19- If the heat pump operates reversibly, what power input is required at the compressor?
a) 2300 Btu/hr
c) 3700 Btu/hr
c) 5000 Btu/hr
d) 50000 Btu/hr

20- Which of the following statements are true about this heat pump cycle?
a) the condenser operates at higher pressure than the evaporator
b) the quality decreases as refrigerant moves through the evaporator
c) the thermal energy extracted from the low temperature reservoir is more than 50,000 Btu/hr
d) the compressor delivers superheated vapor to the condenser