Name:____________________________ Instructor:____________ Section:___________ ENGR 222 - Quiz 8

Allowed Materials: *pencils and/or pens.*

ExamForm := 85

Honor Statement: *On my honor, I promise that I have not received any unauthorized assistance on this exam (I didn't look at another student's paper, I didn't view any unauthorized written materials, I didn't talk or listen to another student, I didn't use an unauthorized calculator, I didn't use any electronic device, any visual or auditory signals, or any other techniques of exchanging information with others.) I have maintained the highest standards of academic integrity while completing this exam.*

*Signed:*____

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1. *(2 point deduction for failure to complete this problem!)*

Bubble:	For Course Section:	
01	001	Hollins
02	002	Reeves
03	003	Reis

- Write in all of the indicated information in the boxes of your response form.
- Darken the appropriate circles to encode the corresponding information.
- Write your name on this exam and sign the Honor Statement.

Notes:
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- **"F.I."** and **"M.I."** are your first and middle initials, respectively
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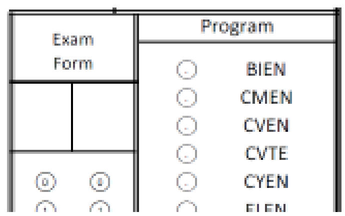
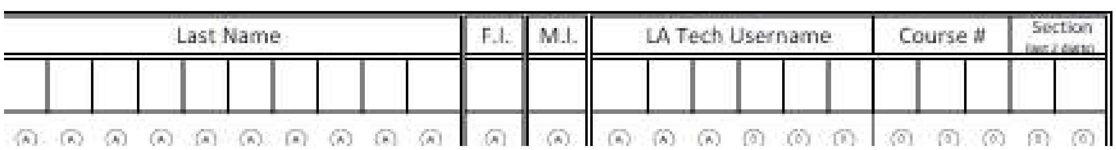




$$\text{Choices} = \begin{pmatrix} \text{"A"} & \text{"I properly completed all required items in problem 1, so I will not lose these points"} \\ \text{"B"} & \text{"I did not properly complete problem 1 because I am fine with losing these points."} \end{pmatrix}$$

Please put your final answers on the answer sheet that was given to you. You must show your work to receive full credit.

The words "steam" and "water" may be used interchangably. Check the tables to determine the phase of the system.

Unless the problem states otherwise, assume that the atmospheric pressure is 101.325 kPa or 14.7 psia.

Read the questions carefully and CHECK YOUR UNITS.

You may write on the exam. There is additional space on the back if you need it.

If you made any marks in your steam table, please erase them before turning in your packet.

Good luck!

2. (10 points) Which of the following ideal cycles is the most efficient power cycle for a given set of temperature limits (T_H, T_L)?

$$\text{Choices} = \begin{pmatrix} \text{"A"} & \text{"Vapor Compression"} \\ \text{"B"} & \text{"Carnot Power Cycle"} \\ \text{"C"} & \text{"Brayton Cycle"} \\ \text{"D"} & \text{"Rankine Cycle"} \\ \text{"E"} & \text{"Insufficient Info"} \end{pmatrix}$$

3. (10 points) Which of the following are NOT part of the ideal vapor-compression refrigeration cycle? BUBBLE ALL THAT APPLY.

$$\text{Choices} = \begin{pmatrix} \text{"A"} & \text{"isenthalpic expansion"} \\ \text{"B"} & \text{"isenthalpic compression"} \\ \text{"C"} & \text{"isothermal heat addition"} \\ \text{"D"} & \text{"isobaric heat rejection"} \\ \text{"E"} & \text{"isentropic compression"} \\ \text{"F"} & \text{"isentropic expansion"} \end{pmatrix}$$

4. (10 points) Which of the following is included in the cold-air-standard assumptions but not in the air-standard assumptions for gas power cycles? (Bubble only ONE)

$$\text{Choices} = \begin{pmatrix} \text{"A"} & \text{"Combustion is replaced by heat addition from external source"} \\ \text{"B"} & \text{"Exhaust is replaced by heat rejection to outside sink"} \\ \text{"C"} & \text{"The specific heats are constant"} \\ \text{"D"} & \text{"All processes are internally reversible"} \\ \text{"E"} & \text{"The working fluid is 100\% air"} \end{pmatrix}$$

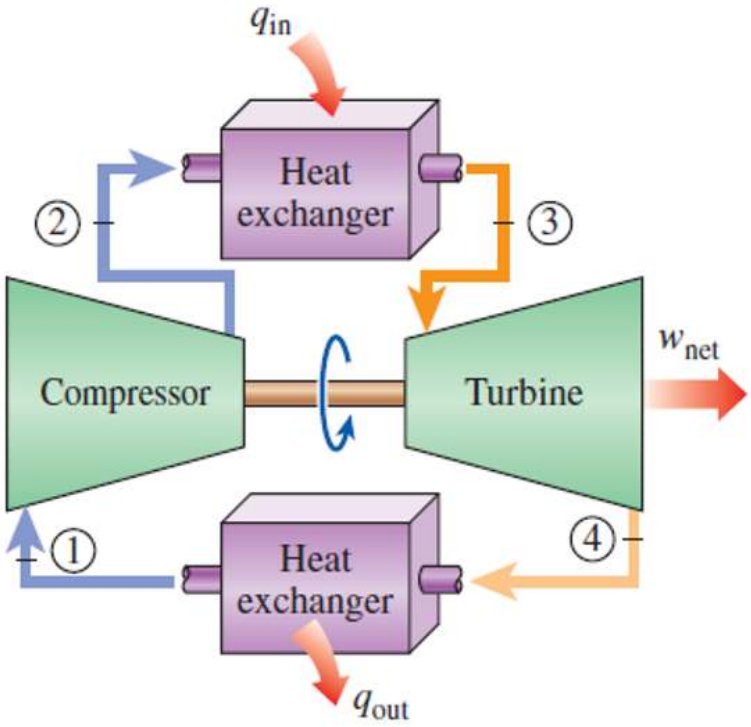
5. (10 points) Which ideal cycle (Brayton or Rankine) has a higher back-work ratio, and why? (Bubble only ONE.)

$$\text{Choices} = \begin{pmatrix} \text{"A"} & \text{"Brayton; gases flow easier than liquids"} \\ \text{"B"} & \text{"Rankine; gases are hotter than liquids"} \\ \text{"C"} & \text{"Rankine; gases flow easier than liquids"} \\ \text{"D"} & \text{"Brayton; liquids are denser than gases"} \\ \text{"E"} & \text{"Rankine; liquids are denser than gases"} \\ \text{"F"} & \text{"Brayton; gases are hotter than liquids"} \end{pmatrix}$$

A plant operates on a simple, ideal Brayton cycle. Air enters the compressor at $T_1 = 260K$ and enters the turbine at $T_3 = 1500K$. The cycle's pressure $ratio = 7.2$. Assuming cold air standards, answer the following:

6. (10 points) What is the exit temperature from the compressor?

$$Choices = \begin{pmatrix} "A" & 230.6 \\ "B" & 263.5 \\ "C" & 295.4 \\ "D" & 327.7 \\ "E" & 360.0 \\ "F" & 392.4 \\ "G" & 424.6 \\ "H" & 457.0 \end{pmatrix} \cdot K$$



7. (10 points) What is the net work output?

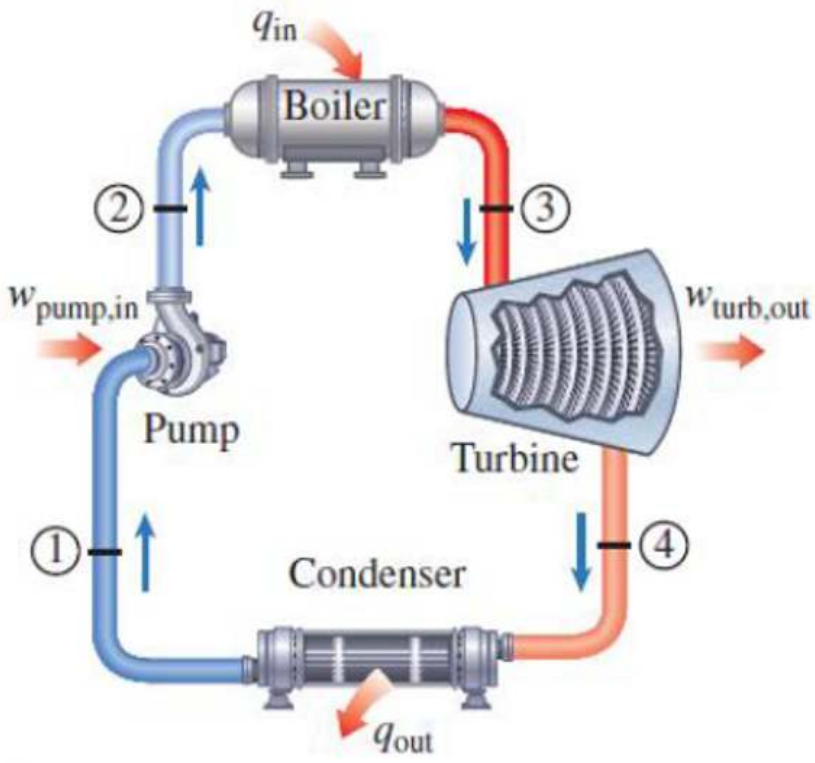
$$Choices = \begin{pmatrix} "A" & 355.8 \\ "B" & 387.8 \\ "C" & 419.8 \\ "D" & 451.9 \\ "E" & 483.8 \\ "F" & 515.6 \\ "G" & 547.6 \\ "H" & 579.8 \end{pmatrix} \cdot \frac{kJ}{kg}$$

A heat engine operates on a Rankine cycle. Water enters the pump at $P_1 = 25 \cdot kPa$ and enters the turbine at $T_3 = 500 \cdot °C$. The cycle has a pressure $ratio = 400$ and a mass flow $rate = 14 \frac{kg}{s}$. The isentropic efficiencies are $\eta_{pump} = 92 \cdot \%$ and $\eta_{turbine} = 93 \cdot \%$.

Note: Do NOT assume the density of water is 1000kg/m^3; use the tables instead.

8. (10 points) What is the power requred by the pump?

$$Choices = \begin{pmatrix} "A" & 143.9 \\ "B" & 154.8 \\ "C" & 165.8 \\ "D" & 176.8 \\ "E" & 187.7 \\ "F" & 198.8 \\ "G" & 209.7 \\ "H" & 220.4 \end{pmatrix} \cdot kW$$



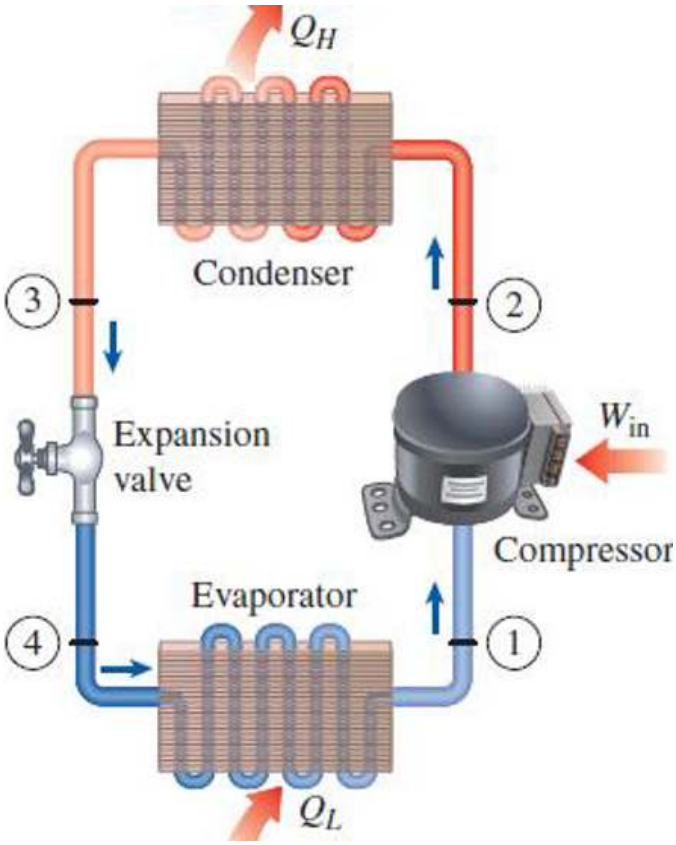
9. (10 points) What is thermal efficiency?

$$Choices = \begin{pmatrix} "A" & 22.58 \\ "B" & 25.03 \\ "C" & 27.51 \\ "D" & 30.01 \\ "E" & 32.47 \\ "F" & 34.94 \\ "G" & 37.42 \\ "H" & 39.87 \end{pmatrix} \cdot \%$$

A heat pump operates on a simple, ideal vapor-compression cycle between $P_{low} = 100 \cdot kPa$ and $P_{high} = 900 \cdot kPa$, with R-134a as the working fluid.

10. (10 points) What is the temperature of the refrigerent entering the evaporator?

$$\text{Choices} = \begin{pmatrix} \text{"A"} & -17.04 \\ \text{"B"} & -18.89 \\ \text{"C"} & -20.76 \\ \text{"D"} & -22.64 \\ \text{"E"} & -24.51 \\ \text{"F"} & -26.37 \\ \text{"G"} & -28.23 \\ \text{"H"} & -30.10 \end{pmatrix} \cdot °C$$



11. (10 points) What is the COP?

$$\text{Choices} = \begin{pmatrix} \text{"A"} & 3.62 \\ \text{"B"} & 3.90 \\ \text{"C"} & 4.17 \\ \text{"D"} & 4.45 \\ \text{"E"} & 4.72 \\ \text{"F"} & 5.00 \\ \text{"G"} & 5.28 \\ \text{"H"} & 5.56 \end{pmatrix}$$

END OF EXAM

Bubble:
01
02
03

For Course Section:	
001	Hollins
002	Reeves
003	Reis

ExamForm = 85

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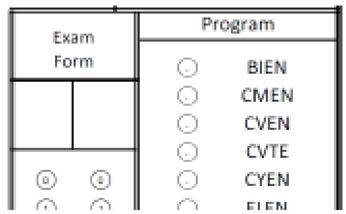

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Read the questions carefully and CHECK YOUR UNITS.

If a question does not contain enough information to solve, please select the appropriate answer "not enough information".

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Good luck!

ExamForm = 85

Key =

	1
1	"A"
2	"B"
3	"BF"
4	"C"
5	"D"
6	"H"
7	"D"
8	"B"
9	"F"
10	"F"
11	"B"