Name:____________________________ Instructor:____________ Section:___________ ENGR 222 - Quiz 5

Allowed Materials: *pencils and/or pens.*

ExamForm := 55

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:
- If your last name is too long, just write the first 10 letters.
- **"F.I."** and **"M.I."** are your first and middle initials, respectively
- Your **"Username"** is the first part of your LATech email address
- For **"Section"** use the guide provided to the right
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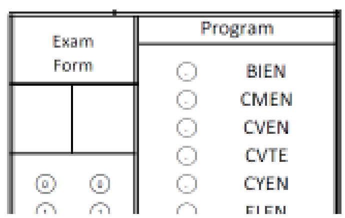
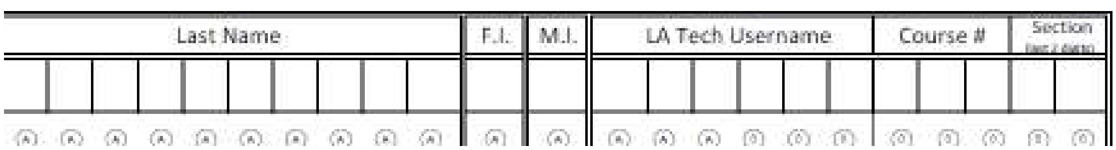
- Indicate "ENGR" as the **"Program"**





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

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 is NOT TRUE for heat engines?

$$\text{Choices} = \begin{pmatrix} \text{"A"} & \text{"they reject some of the heat into a low temperature sink"} \\ \text{"B"} & \text{"they operate on a cycle"} \\ \text{"C"} & \text{"they transfer heat from a cool space to a warmer space"} \\ \text{"D"} & \text{"they recieve heat from a high temperature source"} \\ \text{"E"} & \text{"they convert some of the heat into work"} \end{pmatrix}$$

3. (10 points) The (exposed or visible) coils on the back of your refrigerator serve as what part in the refrigeration cycle:

$$\text{Choices} = \begin{pmatrix} \text{"A"} & \text{"evaporator"} \\ \text{"B"} & \text{"throttling valve"} \\ \text{"C"} & \text{"condenser"} \\ \text{"D"} & \text{"turbine"} \\ \text{"E"} & \text{"compressor"} \end{pmatrix}$$

4. (10 points) Lowering the thermostat setting of the refrigerated space on a working refrigerator will also:

$$\text{Choices} = \begin{pmatrix} \text{"A"} & \text{"decrease power consumption"} \\ \text{"B"} & \text{"lower the temperature of the surroundings"} \\ \text{"C"} & \text{"decrease toxic gas emissions"} \\ \text{"D"} & \text{"lower the COP of the refrigerator"} \\ \text{"E"} & \text{"lower your electric bill"} \end{pmatrix}$$

5. (10 points) A heat engine $\text{absorbs} = 2400\,\text{kW}$ of heat from a furnace and operates at an $\text{efficiency} = 62\,\%$. The amount of heat rejected by the heat engine is closest to:

$$\text{Choices} = \begin{pmatrix} \text{"A"} & 690 \\ \text{"B"} & 746 \\ \text{"C"} & 801 \\ \text{"D"} & 857 \\ \text{"E"} & 912 \\ \text{"F"} & 967 \\ \text{"G"} & 1023 \end{pmatrix} \cdot \text{kW}$$

6. (10 points) A heat pump $\text{absorbs} = 6900\,\frac{\text{Btu}}{\text{hr}}$ of heat from outside to keep a house warm at a constant 72°F. If the house is $\text{losing} = 8700\,\frac{\text{Btu}}{\text{hr}}$ of heat, the COP of the heat pump necessary to keep the house's temperature constant is closest to:

$$\text{Choices} = \begin{pmatrix} \text{"A"} & 4.10 \\ \text{"B"} & 4.34 \\ \text{"C"} & 4.59 \\ \text{"D"} & 4.83 \\ \text{"E"} & 5.08 \\ \text{"F"} & 5.32 \\ \text{"G"} & 5.57 \\ \text{"H"} & 5.81 \end{pmatrix}$$

7. (10 points) A steam power plant uses coal to heat water that enters the boiler at 30 ºC and $\text{pressure} = 2 \cdot \text{MPa}$ and at a rate of 40 kg/s and leaves at 500 ºC and at the same inlet pressure. If the heat engine operates at an $\text{efficiency} = 44 \cdot \%$, the amount of net work produced is closest to:

$$\text{Choices} = \begin{pmatrix} \text{"A"} & 58.83 \\ \text{"B"} & 62.40 \\ \text{"C"} & 66.00 \\ \text{"D"} & 69.54 \\ \text{"E"} & 73.13 \\ \text{"F"} & 76.75 \\ \text{"G"} & 80.28 \\ \text{"H"} & 83.85 \end{pmatrix} \cdot \text{MW}$$

10. (8 points) An inventor claims to have made a new kind of heat engine that $\text{absorbs} = 810 \cdot \frac{\text{Btu}}{\text{hr}}$ of geothermal heat at an average temperature $\text{of} = 120 \cdot °\text{F}$ and rejects heat into the atmosphere at 65 ºF. If the engine $\text{produces} = 160 \cdot \frac{\text{Btu}}{\text{hr}}$ of work, then the efficiency of the "proposed" engine is closest to:

$$\text{Choices} = \begin{pmatrix} \text{"A"} & 13.7 \\ \text{"B"} & 14.8 \\ \text{"C"} & 15.7 \\ \text{"D"} & 16.8 \\ \text{"E"} & 17.8 \\ \text{"F"} & 18.8 \\ \text{"G"} & 19.8 \\ \text{"H"} & 20.8 \end{pmatrix} \cdot \%$$

12. (10 points) A coal-burning power plant uses a heat engine cycle that operates $\text{at} = 71 \cdot \%$ efficiency. The power plant must $\text{produce} = 22 \cdot \text{MW}$ of work. The heating value of coal is 16,000 kJ/kg. Assuming that only 85% of the heat from the coal combustion actually enters the working fluid, the rate of coal that must be fed into the furnace is closest to:

$$\text{Choices} = \begin{pmatrix} \text{"A"} & 6537 \\ \text{"B"} & 6951 \\ \text{"C"} & 7373 \\ \text{"D"} & 7787 \\ \text{"E"} & 8202 \\ \text{"F"} & 8619 \\ \text{"G"} & 9033 \\ \text{"H"} & 9448 \end{pmatrix} \cdot \frac{\text{kg}}{\text{hr}}$$

END OF EXAM

Bubble:	For Course Section:	
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1. ***(2 point deduction for failure to complete this problem!)***

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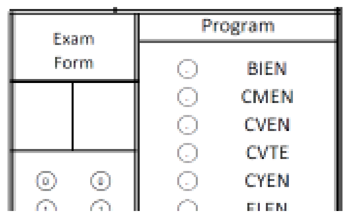

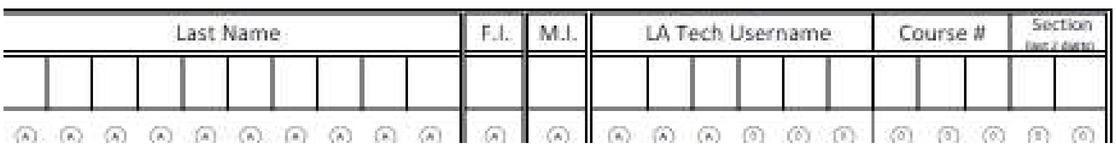

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Unless the problem states otherwise, assume that the atmospheric pressure is 101.325 kPa or 14.7 psia.

Read the questions carefully and CHECK YOUR UNITS.

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

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!

ExamForm = 55

Key =

	1
1	"A"
2	"C"
3	"C"
4	"D"
5	"E"
6	"D"
7	"A"
10	"G"
12	"E"
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