

Name: _____

Instructor: _____
Section: _____

ENGR 120 - Exam 2
November 16, 2015

Allowed Materials: F.E. approved calculator(s) see syllabus; pencils and/or pens.

ExamForm := 24

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: _____

Instructions: Encode your answer to each question by darkening the appropriate circle on your response form. You are also encouraged to work neatly and circle your chosen answers on the exam document so that you are better able to review your work if you find the need. However, the answers you encode on the response form will be taken as your definitive answers, and the entire basis for your grade. Please review your response form carefully before submission.



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

- 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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Exam Form	Program
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<input type="radio"/>	CMEN
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<input type="radio"/>	CVTE
<input type="radio"/>	CYEN
<input type="radio"/>	FIEN

Bubble:	For Course Section:
91	H01 Cronk TR 2-3:50
92	H02 SwanbomTR 8-9:50
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Last Name	F.I.	M.I.	LA Tech Username	Course #	Section (last 2 digits)
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Choices = ("A" "I properly completed all required items in problem 1, so I will not lose these points")
 ("B" "I did not properly complete problem 1 because I am fine with losing these points.")



2. (3 points) On the impeller tutorial, which tool was employed to generate multiples of the 2-D fin profile?

Choices = ("A" "copy/paste"
 "B" "revolve"
 "C" "duplicate"
 "D" "linear pattern"
 "E" "smart sketch"
 "F" "spline"
 "G" "circular pattern"
 "H" "extruded cut")



3. (3 points) After linear regression, a line is found to have an r^2 value of 1. Which of the following is true ?

- Choices =
- "A" "Another line would likely provide a better fit"
 - "B" "The error is very large for the line equation"
 - "C" "The error is small and insignificant for the line"
 - "D" "One variable is completely independent of the other"
 - "E" "There is no relationship between the two variables"
 - "F" "One variable depends completely on the other"
 - "G" "The "r" value will be less than one"
 - "H" "The error is small, but significant for the line"



4. (3 points) What is the process for setting the z value to zero on the DRO of the milling machine?

- Choices =
- "A" "Turn the DRO off and on"
 - "B" " "All" followed by "Clear" "
 - "C" " "Clear" followed by "All" "
 - "D" " "Z-spindle" followed by "Clear" "
 - "E" " "Clear" followed by "Z" "
 - "F" " "Clear" followed by "Z-spindle" "
 - "G" "Clear"
 - "H" " "Z" followed by "Clear" "



5. (3 points) The photoresistor circuit implemented in class was called a _____ circuit.

- Choices =
- "A" "Current Splicing"
 - "B" "Voltage Divider"
 - "C" "Current Divider"
 - "D" "Kirchhoff"
 - "E" "Resistance"
 - "F" "Digital Read"
 - "G" "Voltage Reader"
 - "H" "Parallel"



6. (3 points) What two materials were the faceplate and body, respectively, made of in your pump?

- Choices =
- "A" "PLA and PDMS"
 - "B" "PVC and PDMS"
 - "C" "PLA and PVC"
 - "D" "PLA and PLA"
 - "E" "PVC and PVC"
 - "F" "PDMS and PVC"
 - "G" "PVC and PLA"
 - "H" "PDMS and PDMS"



7. (3 points) Which of the following was not used to determine the efficiency of your pump?

Choices = $\left(\begin{array}{l} \text{"A"} \quad \text{"Potential Energy"} \\ \text{"B"} \quad \quad \text{"Pump Head"} \\ \text{"C"} \quad \quad \text{"Kinetic Energy"} \\ \text{"D"} \quad \quad \text{"Voltage"} \\ \text{"E"} \quad \quad \text{"Mass of Water"} \\ \text{"F"} \quad \text{"Electrical Current"} \\ \text{"G"} \quad \text{"Impeller Diameter"} \\ \text{"H"} \quad \text{"Velocity of Water"} \end{array} \right)$



8. (3 points) _____ are lines of code that are given a name by the user and written once at the end of a sketch (outside of the setup and loop functions). The name can then be used within the sketch instead of writing the code multiple times.

Choices = $\left(\begin{array}{l} \text{"A"} \quad \text{"command"} \\ \text{"B"} \quad \text{"switch"} \\ \text{"C"} \quad \text{"syntax"} \\ \text{"D"} \quad \text{"library"} \\ \text{"E"} \quad \text{"counter"} \\ \text{"F"} \quad \text{"function"} \\ \text{"G"} \quad \text{"delay"} \\ \text{"H"} \quad \text{"if statment"} \end{array} \right)$



9. (3 points) Which of the following is not currently an engineering major offered by Louisiana Tech?

Hint: Remember the robot challenge!

Choices = $\left(\begin{array}{l} \text{"A"} \quad \text{"Electrical Engineering"} \\ \text{"B"} \quad \text{"Nanosystems Engineering"} \\ \text{"C"} \quad \text{"Biomedical Engineering"} \\ \text{"D"} \quad \quad \text{"Cyber Engineering"} \\ \text{"E"} \quad \text{"Industrial Engineering"} \\ \text{"F"} \quad \quad \text{"Civil Engineering"} \\ \text{"G"} \quad \text{"Chemical Engineering"} \\ \text{"H"} \quad \text{"Petroleum Engineering"} \\ \text{"I"} \quad \text{"Mechanical Engineering"} \end{array} \right)$



10. (3 points) A pump requires the input given below. If the system operates according to the given efficiency, what is the usable output?

Input_Power = 201 J

Efficiency = 21.3%

Choices = $\left(\begin{array}{l} \text{"A"} \quad 179.7 \\ \text{"B"} \quad \quad 0.2 \\ \text{"C"} \quad 943.7 \\ \text{"D"} \quad 201.0 \\ \text{"E"} \quad 42.8 \\ \text{"F"} \quad \quad 0.0 \\ \text{"G"} \quad 222.3 \\ \text{"H"} \quad 40401.0 \end{array} \right) \text{ J}$



11. (3 points) How many ducks begin in "base" for the robot competition?

Choices = $\left(\begin{array}{l} \text{"A"} \text{ "1"} \\ \text{"B"} \text{ "6"} \\ \text{"C"} \text{ "5"} \\ \text{"D"} \text{ "0"} \\ \text{"E"} \text{ "2"} \\ \text{"F"} \text{ "3"} \\ \text{"G"} \text{ "7"} \\ \text{"H"} \text{ "4"} \end{array} \right)$



12. (5 points) If the dataset given below is modeled by the form $y = mx+b$ using linear regression, then m is closest to:

Data_set =

"x"	"y"
2	2
-1	5
-3	15

Choices = $\left(\begin{array}{l} \text{"A"} \text{ } -2.173 \\ \text{"B"} \text{ } -2.324 \\ \text{"C"} \text{ } -2.474 \\ \text{"D"} \text{ } -2.624 \\ \text{"E"} \text{ } -2.774 \\ \text{"F"} \text{ } -2.924 \\ \text{"G"} \text{ } -3.073 \\ \text{"H"} \text{ } -3.226 \end{array} \right)$



13. (5 points) A linear model has been determined to be best for the data below. The value of "m" is closest to ...

Data_set =

"x"	"y"
2	-1
1	5
-1	10
-3	18

Choices =

"A"	-3.38
"B"	-3.59
"C"	-3.81
"D"	-4.03
"E"	-4.25
"F"	-4.47
"G"	-4.69
"H"	-4.91



14. (5 points) The model $y=mx+b$ is determined for the data set below. Given that $m = -2.90476$ the value of "b" is closest to ...

Data_set =

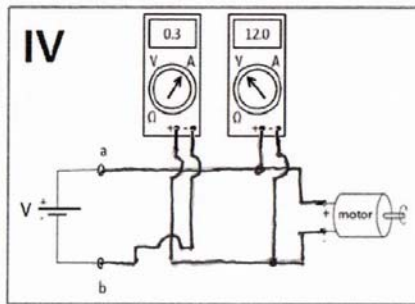
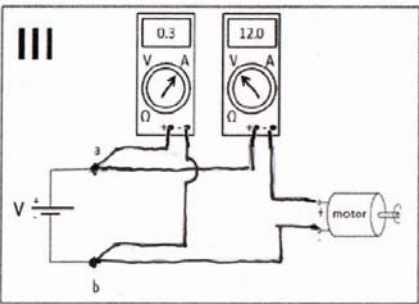
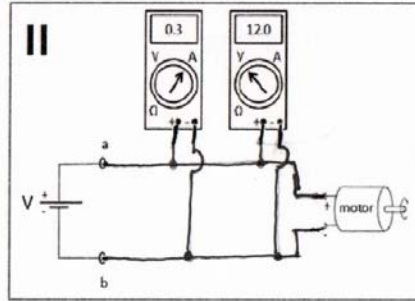
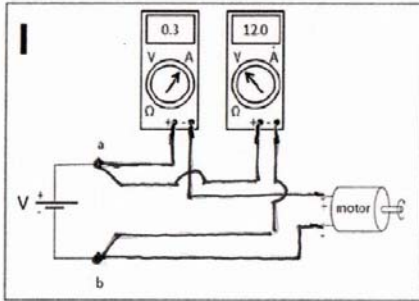
"x"	"y"
1	0
0	8
-2	13
-5	19

Choices =

"A"	3.252
"B"	3.592
"C"	3.926
"D"	4.274
"E"	4.615
"F"	4.957
"G"	5.300
"H"	5.643

15. (5 points) Using your experience from the centrifugal water pump testing you did in class and/or at helpdesk hours, the setup for determining the power input to your pump can be shown by

Hint: Pay attention to the multimeter settings!



- Choices =
- "A" "III and IV"
 - "B" "II and III"
 - "C" "IV only"
 - "D" "I and IV"
 - "E" "I only"
 - "F" "II only"
 - "G" "III only"
 - "H" "I and III"
 - "I" "II and IV"

16. (5 points) It takes 10 minutes to fill the kiddie pool shown with the mass of water shown. If the hose they use has a diameter of 3/4 in, the average velocity of the water is closest to:

- Choices =
- "A" 1.67
 - "B" 1.80
 - "C" 1.92
 - "D" 2.05
 - "E" 2.17
 - "F" 2.29
 - "G" 2.42
 - "H" 2.54
- $\frac{\text{m}}{\text{s}}$



mass = 350 kg



17. (5 points) A drinking fountain pumps water to an outlet 1.5 meters above the water level of the reservoir. The outlet has a diameter of 6 mm. If the pump is 25% efficient, the power required to produce a stream at the velocity shown is closest to:

$$v = 1.5 \frac{\text{m}}{\text{s}}$$



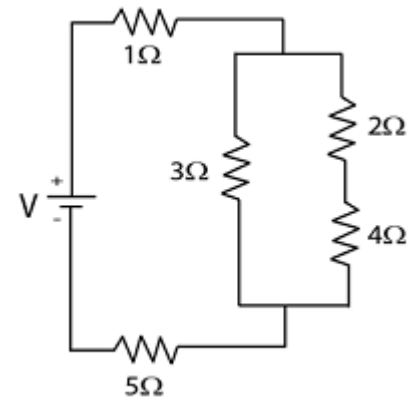
CoolClips.com

- Choices =
- | | |
|-----|------|
| "A" | 1.87 |
| "B" | 2.04 |
| "C" | 2.20 |
| "D" | 2.36 |
| "E" | 2.52 |
| "F" | 2.69 |
| "G" | 2.85 |
| "H" | 3.01 |
| "I" | 3.17 |
| "J" | 3.34 |
- .W



18. (5 points) Assume the source voltage is as given below. The voltage drop across the 5Ω resistor is closest to:

Choices = $\left(\begin{array}{l} \text{"A"} \quad 8.52 \\ \text{"B"} \quad 9.20 \\ \text{"C"} \quad 9.88 \\ \text{"D"} \quad 10.56 \\ \text{"E"} \quad 11.25 \\ \text{"F"} \quad 11.93 \\ \text{"G"} \quad 12.62 \\ \text{"H"} \quad 13.31 \end{array} \right) \cdot V$

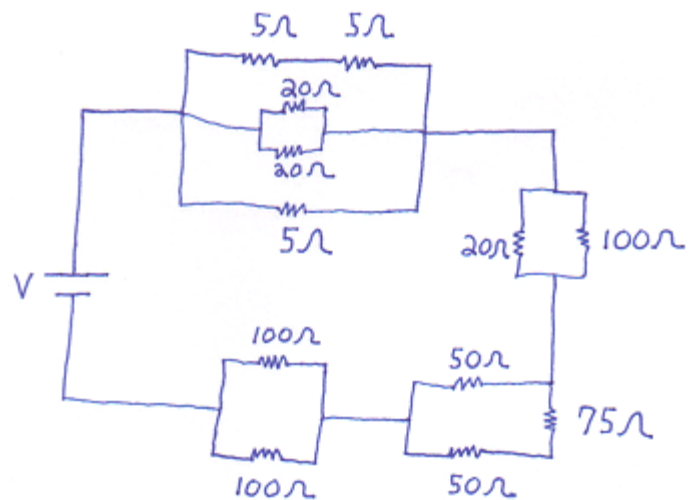


SourceVoltage = 18 V



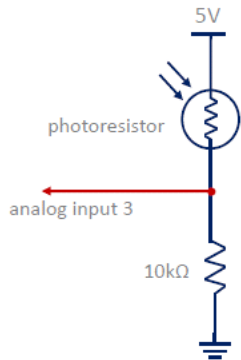
19. (5 points) Assume the source voltage is as given below. The power dissipated by the 75Ω resistor is closest to:

Choices = $\left(\begin{array}{l} \text{"A"} \quad 0.1475 \\ \text{"B"} \quad 0.1584 \\ \text{"C"} \quad 0.1694 \\ \text{"D"} \quad 0.1803 \\ \text{"E"} \quad 0.1913 \\ \text{"F"} \quad 0.2023 \\ \text{"G"} \quad 0.2131 \\ \text{"H"} \quad 0.2241 \\ \text{"I"} \quad 0.2350 \\ \text{"J"} \quad 0.2462 \end{array} \right) W$



SourceVolt = 18 V

20. (5 points) The photoresistor circuit used in class is attached to analog input 3 to “measure” the light level. If the light level is such that the resistance of the photoresistor is $2,800\ \Omega$, then the Serial Monitor will show that “val” is closest to:



Choices =

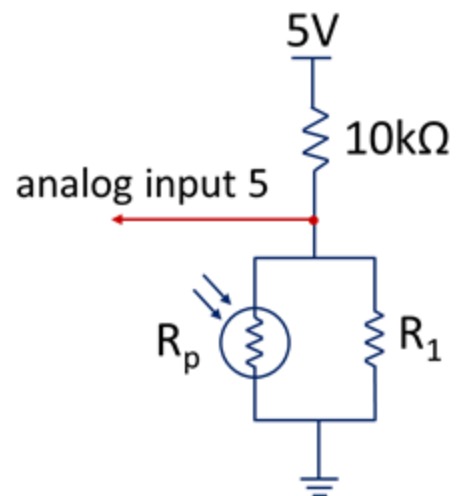
"A"	507
"B"	557
"C"	604
"D"	654
"E"	702
"F"	750
"G"	799
"H"	847
"I"	896
"J"	945

21. (5 points) A photoresistor circuit is used to measure light level. If $R_1 = 12\text{-k}\Omega$, and the value returned by `analogRead` = 357 then the instantaneous resistance of the photoresistor, R_p , is closest to:

Choices =

"A"	6742
"B"	7328
"C"	7919
"D"	8515
"E"	9101
"F"	9688
"G"	10278
"H"	10862
"I"	11458
"J"	12052

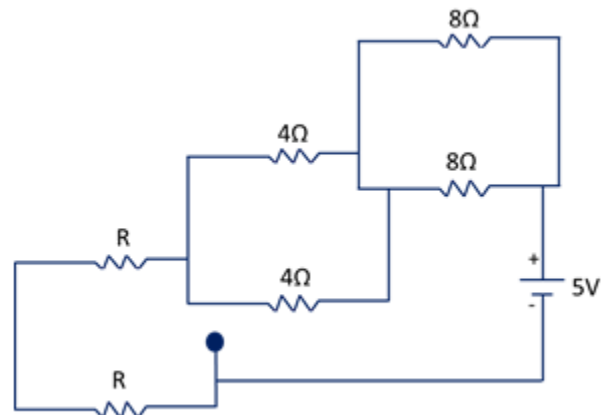
Ω





22. (5 points) If $R = 5\ \Omega$, then the equivalent resistance of the circuit is closest to:

- Choices = $\left(\begin{array}{l} \text{"A"}\ 16 \\ \text{"B"}\ 18 \\ \text{"C"}\ 19 \\ \text{"D"}\ 21 \\ \text{"E"}\ 22 \\ \text{"F"}\ 24 \\ \text{"G"}\ 26 \\ \text{"H"}\ 27 \end{array} \right) \Omega$



23. (5 points) A senior design group in Electrical Engineering is building a fountain display like the ones they have seen in front of the hotels in Las Vegas. They have selected a pump that shoots the water 50 feet into the air and has the electrical characteristics provided. The volume of water pumped over the given pumping time is closest to ...

*Hint: Assume no energy is lost between the nozzle and the peak.
Assume the velocity is zero at the peak.
Assume the nozzle is at the same elevation as the water supply reservoir.*

$$\text{Volts}_{\text{motor}} = 13.2\ \text{V}$$

$$I_{\text{motor}} = 1.23\ \text{A}$$

$$\eta = 3.1\%$$

$$\text{Pumping}_{\text{time}} = 5.3\ \text{hr}$$

- Choices = $\left(\begin{array}{l} \text{"A"}\ 13.88 \\ \text{"B"}\ 14.91 \\ \text{"C"}\ 15.94 \\ \text{"D"}\ 16.97 \\ \text{"E"}\ 18.00 \\ \text{"F"}\ 19.03 \\ \text{"G"}\ 20.05 \\ \text{"H"}\ 21.10 \\ \text{"I"}\ 22.14 \\ \text{"J"}\ 23.15 \end{array} \right) \cdot \text{gal}$

24. (5 points) The Lambright intramural center is refilling their outdoor pool with a $\text{Volume} = 2.50 \times 10^6 \cdot \text{L}$. The pump and the free surface of the supply reservoir are both located a $\text{height} = 10\text{-m}$ below the end of the tube where the water exits. The pump is 10% efficient when powered using 120V and 12A. The water comes out of the tube connected to the pump at a velocity of 2 m/s, then drops into the pool. The cost of electricity in Ruston is $\$0.054/(\text{kW hr})$. The energy cost of refilling the pool is closest to...

$$\text{Choices} = \begin{pmatrix} \text{"A"} & 35.25 \\ \text{"B"} & 37.54 \\ \text{"C"} & 39.81 \\ \text{"D"} & 42.09 \\ \text{"E"} & 44.39 \\ \text{"F"} & 46.67 \\ \text{"G"} & 48.97 \\ \text{"H"} & 51.20 \\ \text{"I"} & 53.55 \\ \text{"J"} & 55.76 \end{pmatrix} \cdot \text{dollars}$$

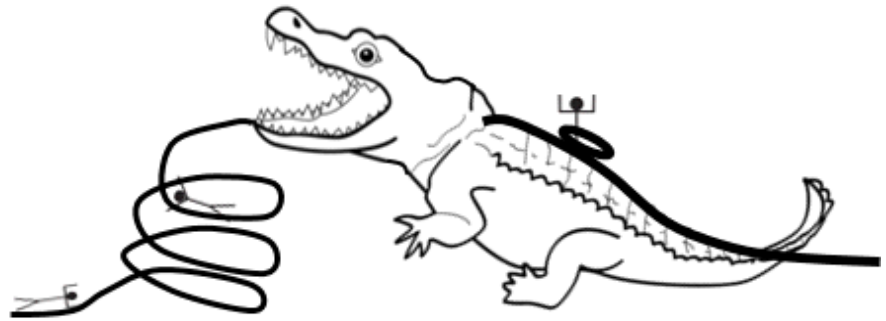
25. (5 points) A student decides to use his ENGR 120 pump to transfer (or rather steal) water from the pool at his apartment complex and fill a small personal pool in his room. The pump has an $\text{efficiency} = 14\%$ and requires 1.5A to be supplied at 12 V. The pool is located at a height of 15 m below his window. Water leaves the tube and enters the indoor pool at a velocity of 0.2 m/s. If the pool has a $\text{volume} = 1900\text{L}$, the time it will take the pool to fill up is closest to...

$$\text{Choices} = \begin{pmatrix} \text{"A"} & 21.44 \\ \text{"B"} & 23.31 \\ \text{"C"} & 25.19 \\ \text{"D"} & 27.08 \\ \text{"E"} & 28.95 \\ \text{"F"} & 30.82 \\ \text{"G"} & 32.69 \\ \text{"H"} & 34.56 \end{pmatrix} \cdot \text{hr}$$



26. (5 points) Blu n' Red Bayou Waterpark's most famous attraction is the two ride alligator structure that sits in the center of the park. The two featured rides are the "Gator Death Roll" corkscrew slide and the "Tail Tube Slide". One pump is used to move water up to both slides. The corkscrew slide is located $\text{height} = 80\text{ m}$ above the pump and the velocity of the water at the top of the slide is negligible (i.e. assume $v = 0$). The tube slide is located 70 m above the pump and the water leaving at the top of the slide has a velocity of 3 m/s . The corkscrew requires water at a rate of 30 gal/min , while the tube slide requires 90 gal/min . If the pump has an $\text{efficiency} = 23\%$, the amount of power required to operate the pump is closest to...

- Choices =
- | | |
|-----|-------|
| "A" | 17.83 |
| "B" | 19.25 |
| "C" | 20.66 |
| "D" | 22.09 |
| "E" | 23.52 |
| "F" | 24.95 |
| "G" | 26.37 |
| "H" | 27.81 |
| "I" | 29.22 |
| "J" | 30.67 |
- .kW



Reference Information:

$$\eta = \frac{\frac{1}{2}mv^2 + Wh}{VIt}$$

$$m = \frac{W}{g}$$

$$Vol = \frac{W}{\rho g}$$

$$v = \frac{Vol}{At} = \frac{W}{\rho g At}$$

$$Q = v \cdot A$$

$$A = \frac{\pi}{4}d^2 = \pi r^2$$

 Density of water = 1000 kg/m³ = 1 g/cm³

Density of water = 1 kg/L

1 kg = 1000 g

1 L = 0.001 m³g = 9.81 m/s²

1 gallon = 3.785 L

1 inch = 2.54 cm 1 foot = 12 in

1 coulomb = 6.24(10)¹⁸ electronsAvogadro's Number = 6.022(10)²³ per molcylinder volume = $\frac{\pi \cdot \text{diameter}^2}{4} \cdot \text{height}$

$$m = \frac{n(\sum x_i y_i) - (\sum x_i)(\sum y_i)}{n(\sum x_i^2) - (\sum x_i)^2}$$

$$b = \frac{\sum y_i - m(\sum x_i)}{n}$$

$$r^2 = \left[\frac{n(\sum x_i y_i) - (\sum x_i)(\sum y_i)}{\sqrt{n(\sum x_i^2) - (\sum x_i)^2} \sqrt{n(\sum y_i^2) - (\sum y_i)^2}} \right]^2$$

color	digit
black	0
brown	1
red	2
orange	3
yellow	4
green	5
blue	6
violet	7
gray	8
white	9



ExamForm = 24

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

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- Darken the appropriate circles to encode the corresponding information.
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Last Name	F.I.	M.I.	LA Tech Username	Course #	Section (last 2 digits)
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
(A) (A) (A) (A) (A) (A) (A) (A) (A) (A)	(A)	(A)	(A) (A) (A) (0) (0) (0)	(0) (0) (0) (0) (0)	

Choices = ("A" "I properly completed all required items in problem 1, so I will not lose these points")
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