CSCI 49590/79530§001; Exam, Evacuation Day 2024_q

Name (in box below)	EMPLID								Seat

Directions:

Read these directions.

Put your name on this paper where indicated above. Be sure your name and question number are on any separate bits of paper (like the slide rules)

Write your answers in the space provided on these sheets. Show your work. Only the parts of the answers that you write down will be graded. You may not use any books, your notes, or anyone else's notes or work. You may use a paper bilingual dictionary, but may not share one with anyone else. You may not communicate to anyone other than the instructor, in any language, on any technology, for any reason. You may not enlist the aid of any persons, spirits, automata, cyborgs or other beings, or denizens of this or any other planes, living, dead, or otherwise. You may be escorted to the restroom. Violation of these directions may result in immediate loss of your exam, and will otherwise cost more points than you think reasonable.

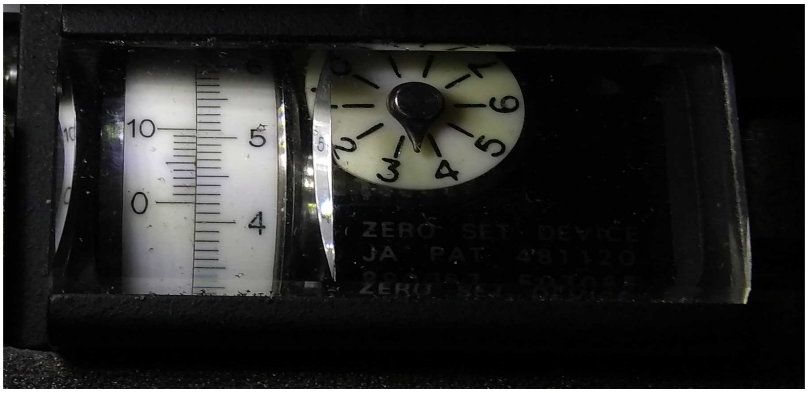
Support your answers with reasons. Remember that an illegible answer is wrong, and that your instructor's eyes are older than yours. His eyes are the arbiter of "legible".

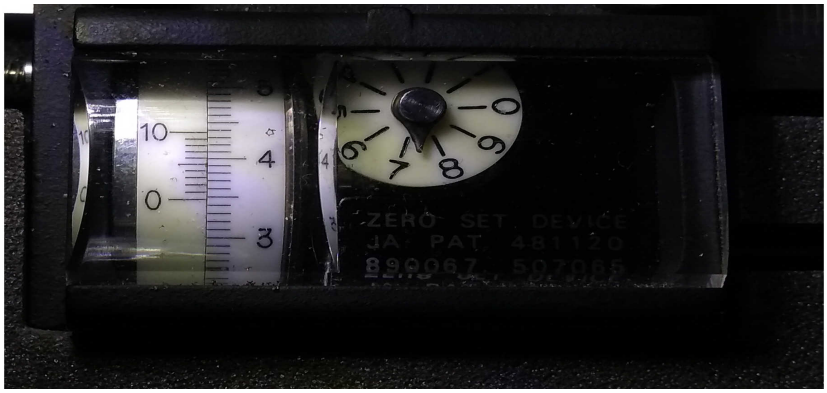
There are eight (8) questions, points valued as marked.

Do Not Open This Exam Until Instructed To Do So

Questions:

1. (10) Next to the pictures below, write the value indicated to the best accuracy possible.





2. (10) Can one create a vernier scale to subdivide a scale in something other than tenths? (For example, an Imperial user may want $\frac{1}{16}$-ths of a unit.) If so, explain how. If not, explain why not.

3. (15) Do the following questions in order! The last two will "freeze" your slide rules! Using the provided paper slide rules and your ruler (as a cursor) find:

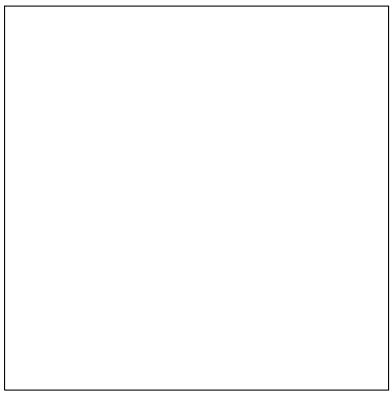
   (a) $\sqrt{22.5}$

   (b) $\sqrt[3]{77}$

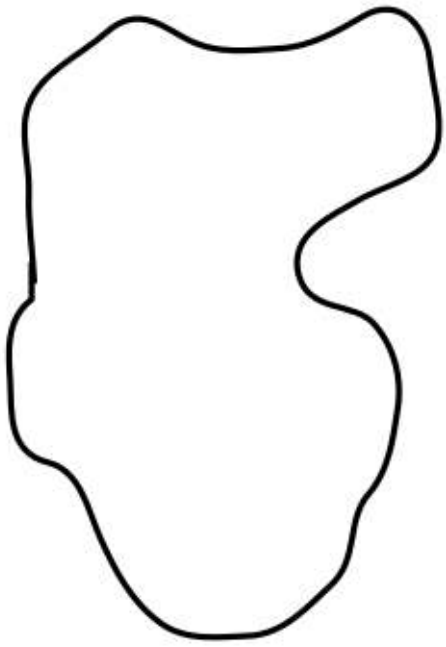
   (c) Calculate $51.5 \div 2.54$. Draw a line on the slide rule to indicate your answer and tape the rule so it can't move. Write your name and the question number on the slide rule. Finally, what is the value (as indicated by the slide-rule)?

   (d) Calculate 4.3×32.4. Draw a line on the slide rule to indicate your answer and tape the rule so it can't move. Write your name and the question number on the slide rule. Finally, what is the value (as indicated by the slide-rule)?

4. (15) Here is a 2×2 inch square box. Use your spoon, with the bowl to the right of the picture, marking the start and end points of the bowl and whatever auxiliary lines you need, to get a 'base' for what follows.



Now find the area of the shape below. Be sure to show your work.



5. (15) On a THAT sheet, draw the following circuits with output at the indicated outputs. You should explain what you are doing in the space provided here. Don't forget to put your name and the question number on the THAT diagram in case pages get separated.

   (a) The value of $(a - b) \times c$ at output Y, where a, b and c are variables between 0 and 1.

   (b) The constant value $\frac{1}{3}$ at output X

   (c) The absolute value of the sum of d and e, $|d - e|$ at output Z. d and e are variables, $0 \leq d, e \leq 1$. Hint:

$$|x| = \begin{cases} x & \text{if } x \geq 0 \\ -x & \text{if } x < 0 \end{cases}$$

6. (15) Sir Remski Catsacough and Rudolf, Prince of Guppies believe there is Deep Meaning in the differential equation $\dot{x} = x^2 - x$ and want to explore the solutions as the initial conditions vary from 0 to 1. Good King Nigel the Beneficent (ruler of the Dependant Micronation of Nigelz) reminds Rudy (and you) that $\dot{x} = x'(t) = \frac{dx}{dt}$. Below, draw the circuit diagram for this and then on a new THAT diagram, indicate the wiring. Use the output X to display the results. Don't forget to put your name and the question number on the THAT diagram in case pages get separated.

7. (10) Electrical circuits are inherently analog things. Marbles and physical counters are inherently digital. How then can there be digital electronic devices? Has all the programming you've learned been a lie?

8. (10) Charles Babbage's Analytical Engine was envisioned by Babbage as a number crunching machine. Lady Ada Augusta, in an appendix to "Sketch of The Analytical Engine Invented by Charles Babbage" claims that the engine could be used for "symbol manipulation". How? Could the Analytical Engine be set up as a word processor? Can an analog computer also be used for symbol manipulation? What about for word processing?