

NAME:

**Open book. No calculators, no computer.  
Write all answers on these sheets. Do not ask questions!**

question	1	2	3	4	5	6	7	total
points								
maximum	20	10	10	10	20	15	15	100

1. A computer vendor wants a program to announce software upgrades to those customers who bought systems to which the upgrade applies. After the user enters a system configuration, the program should return a list of customers that purchased this configuration, along with their emails.

Describe the modular design for this program. What is at the bottom of it?

Draw the dependencies between the modules.

For each module give a one line description of its functionality. Justify your design.

2. Rule #3 for when a bug occurs: “The software does something that the specification doesn’t mention.” Give an example where this rule applies. Explain why it is a bug.

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3. Compare the use of open source versus proprietary software:

(a) Why might open source software be better than proprietary software?  
Give two reasons, explaining each time what “better” means.

(b) Why might proprietary software be better than open source software?  
Give two reasons, explaining each time what “better” means.

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4. What is the use of the `try-except` statement in Python? Describe an example of a good use of a `try-except`. Justify why it is good to use a `try-except` in your example.

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5. The file `distances.txt` contains the following data:

	Boston	Chicago	Denver
Boston	0	983	1991
Chicago	983	0	1050
Denver	1991	1050	0

We see that from Chicago, it takes 983 miles to Boston and 1050 miles to Denver.

In general, do not assume that the cities are listed in the order as shown.

Furthermore, there are more cities on file than shown in the example.

Think of a program that will prompt the user for the name of a file (e.g.: `distances.txt`) and two names of cities, say A and B. The program will then print that the distance between A and B is  $x$  miles, where the number  $x$  is retrieved from the file.

- (a) Describe in plain English (use complete sentences) the structure of the program. What data structures do you use? Which built-in functions do you apply?

- (b) Give Python code. Do not worry about wrong user input or incorrect data.

6. Consider an account management program for a utility company. Customers can login, check the status of their account, make a payment, and logout. After logging in, employees use the program to email bills to customers. Use UML to draw the static architecture of the program using class diagrams. For each object in your drawing, write one line to define what the object represents.

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7. Consider the search in a database matching states and their capitals. We search the database in both ways. Either we provide the name of a state and then the program shows the name of the corresponding capital, or it returns the name of the corresponding state if we give in the name of a capital. Draw the layout of the GUI for this search program. Indicate on your drawing what widgets you will use.

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