CSCI 463-1

Computer Systems Organization

Spring 2023

Homework #1  
 (80 points)

The general directions for every week are as follows (copied from the syllabus). You may lose points if we have to rename or reformat your work.

1) Submit your answers on the given answer sheet. Replace the string ‘anssheet’ with your 4‑letter ID in lowercase, e.g, this week’s answer sheet will be  
463‑2023a‑hw1-xxxx.xlsx, where xxxx = your 4‑letter ID.

2) Also put your name and z‑number in the specified slots at the top of the answer sheet.

3) The answer sheet is in .xlsx format. Save it in the same format. Do not use any other format. (You can use any version of Excel or Open Office; just make sure you save the answer sheet in an appropriate format.)

4) Do not add extra lines to the answer sheet or otherwise change the format unless it’s obviously necessary. Occasionally there will be a calculation or diagram that requires extra lines, but in general I have tried to do all the formatting for you to save you hassle and typing. Please help your TA out by not changing the formatting or the file format. (These items will usually occur at the end of the assignment to make life easier for your TA.)

5) Note the rules for early and late homework on the syllabus.

1a. Draw a truth table for (A+B)C.

1b. Draw a truth table for A+BC.

1c. Are the results equal? Why or why not?

2a. Draw a truth table for (!A)B.

2b. Draw a truth table for !(AB).

2c. Are the results equal? Why or why not?

3. Draw a truth table for A(B+C) + (-A)B.

4. Draw a truth table for A AND (AB OR -A).

5a. If an expression contains 3 variables, what is the maximum number of terms that can be in its sum-of-products form?

5b. If an expression contains 4 variables, what is the maximum number of terms that can be in its sum-of-products form?

6. Write (A+B)C in sum-of-products form, using the truth table you have already written.

7. Write A(B+C)+ (-A)B in sum-of-products form, using the truth table you have already written.

8. Give a reason for each line using rules from the chart on slide 3b‑17e. You are encouraged but not required to state whether it is the AND or the OR form.

An example is provided on slide 3b-17d. For simplicity (and as a good mathematical practice), each line of the homework involves only one rule.

|  |  |
| --- | --- |
| (X + Y)(X + -Y) | given |
| X(X + -Y) + Y(X + -Y) | 8a) |
| (XX + X(-Y)) + Y(X + -Y) | 8b) |
| (XX + X(-Y)) + (YX + Y(-Y)) | 8c) |
| XX + (X(-Y) + (YX + Y(-Y))) | 8d) |
| XX + ((X(-Y) + YX) + Y(-Y)) | 8e) |
| X + ((X(-Y) + YX) + Y(-Y)) | 8f) |
| X + ((X(-Y) + YX) + 0) | 8g) |
| X + (X(-Y) + YX) | 8h) |
| X + (X(-Y) + XY) | 8i) |
| X + X(-Y + Y) | 8j) |
| X + X(Y + -Y) | 8k) |
| X + X\*1 | 8l) |
| X + X | 8m) |
| X | 8n) |