
HW 2 – Binary Decision Diagrams

CS 477 – Spring 2014

Revision 1.0

Assigned February 5, 2014

Due February 12, 2014, 9:00 pm

Extension 48 hours (20% penalty)

1 Change Log

1.0 Initial Release.

2 Objectives and Background

The purpose of this HW is to test your understanding of

- Binary Decision Diagrams and the Shannon Expansion

Another purpose of HWs is to provide you with experience answering non-programming written questions of the kind you may experience on the midterm and final.

3 Turn-In Procedure

The pdf for this assignment (`hw2.pdf`) should be found in the `assignments/hw2/` subdirectory of your `svn` directory for this course. Your solution should be put in that same directory. Using your favorite tool(s), you should put your solution in a file named `hw2-submission.pdf`. If you have problems generating a pdf, please seek help from the course staff. Your answers to the following questions are to be submitted electronically from within `assignments/hw2/` subdirectory by committing the file as follows:

```
svn add hw2-submission.pdf
svn commit -m "Turning in hw2"
```

4 Problem

For each of the following propositions,

- (4 pts each) give the Shannon expansion (out it in `if_then_else_` form),
- (5 pts each) give the reduced ordered binary decision diagram (ROBDD), with the variables order smallest to largest alphabetically,
- (5 pts each) give the reduced ordered binary decision diagram (ROBDD), with the variables order reverse alphabetically,
- (3pts each) say whether it is satisfiable, and if it is, give a valuation satisfying it.

1. $(A \wedge B) \vee (A \wedge C)$

2. $(A \Rightarrow (B \Rightarrow C)) \wedge ((A \Rightarrow B) \Rightarrow C)$

3. $(A \Rightarrow B) \Rightarrow ((A \wedge C) \Rightarrow (B \wedge C))$

5 Extra Credit

4. (10 pts) Given a detailed, rigorous proof that any two different reduced ordered BDDs, over the same variables with the same orderings, there exists a valuation that satisfies one and not the other.