MATH1061/7861 (Ips.) Assignment 1 Due 1pm Tues 12 Aug, 2003

Complete all of the following problems and hand in your solutions to your tutor by 1pm on Tuesday 12 August, 2003. **Make sure that your name and student number are on each sheet of your answers**. Solutions to all the problems will be distributed later.

Completing 5 out of the 6 assignments is compulsory and each of the five assignments will contribute 4% towards your final grade. Late assignments will not be accepted unless you have a very good excuse.

1. Complete the following questions from the textbook:

- Section 1.1, pages 15-17: Questions 10b, 10d, 10e, 22, 32, 40.
- Section 1.2, pages 27-28: Questions 11, 16g.

2. There are 5 mistakes in the following table. Circle each of them.

p	q	$p \vee q$	$p \rightarrow q$	$p \leftrightarrow q$	$p \wedge q$
T	T	T	T	T	T
T	F	F	F	F	F
F	T	T	F	F	F
F	F	F	F	F	T

3. Write each of the following arguments in symbolic form. Then determine whether the argument is valid or invalid, using either a truth table or a discussion of how the argument could be invalid.

(i) Bruce is studying for a mathematics degree or Bruce is studying for an economics degree. If Bruce is studying for a mathematics degree, then Bruce is required to pass MATH1061. Hence Bruce is studying for an economics degree or Bruce is required to pass MATH1061.

(ii) If I eat Kentucky Fried Chicken then I will be beautiful. If I am beautiful, then I will be happy. I am happy. Hence I eat Kentucky Fried Chicken.

4. Complete the following questions from the textbook:

- Section 1.4, pages 55-57: Questions 4, 8, 12.

5. On the Fourex brewery at Milton in Brisbane there is a large advertising sign, containing four copies of the letter 'X' (so the sign reads XXXX). As you drive past, you'll notice that the letters light up following a certain pattern, and each stage of the pattern lasts for about one second. Let – denote a light turned off, and let X denote a light turned on. Then the pattern which the lights follow is:

case					
0	–	–	–	–	(so all letters are off)
1	–	–	–	X	(only the last letter is on)
2	–	–	X	X	(only the last two letters are on)
3	–	X	X	X	(the last three letters are on)
4	X	X	X	X	(all letters are on)
5	–	–	–	–	(all letters turn off)
6	X	X	X	X	(all letters turn on)
7	X	X	X	X	(the whole sign stays lit for an extra second)

The brewery has hired you to design a circuit to control the operation of their sign. To help, they will provide you with the circuit for a small clock, which has three outputs. The three outputs from the clock change each second: for the first second they give 000, then 001, then 010, then 011, then 100, then 101, then 110, then 111. Then they repeat the sequence. Your circuit should require three inputs (which are the three outputs from the clock), and should have four outputs, with each output corresponding to one of the X's on the sign. The X will light up when it receives a 1, and will be off when it receives a 0.

(i) Let your three inputs (from the clock) be called a, b and c. Create an input/output table for each of the four outputs (each of the X's on the sign).

(ii) Design a circuit to match the brewery's requirements.

6. Complete the following questions from the textbook:

- Section 2.1, pages 87-89: Questions 7, 11b, 12b, 28b, 28e.

7. Write each of the following statements in words. Determine if each statement is true or false. Write the negation of each statement is symbolic form.

(i) $\forall x \in \mathbb{R}, \exists y \in \mathbb{R}$ such that $x \geq y$.

(ii) $\exists z \in \mathbb{Z}$ such that $\forall x \in \mathbb{R}, \forall y \in \mathbb{R}$, $x + y \geq z$.