2008 Paper 2 Question 1

Digital Electronics

(*a*) Briefly explain the differences between *combinational* and *sequential* logic.

[2 marks]

(*b*) With the aid of appropriate diagrams, briefly explain the operation of Moore and Mealy finite state machines and highlight their differences. [6 marks]

(*c*) The state sequence for a binary counter is as follows:

A	B	C	D
0	0	1	1
0	1	0	0
0	1	0	1
0	1	1	0
0	1	1	1
1	0	0	0
1	0	0	1
1	0	1	0
1	0	1	1
1	1	0	0

The counter is to be implemented using four synchronously clocked D-type flip-flops.

(*i*) Draw a state table for the counter, showing the required D inputs.

[4 marks]

(*ii*) Find expressions for the D inputs, making use of unused states if appropriate. [6 marks]

(*iii*) What problem could occur when the counter circuit is powered-up? Give *two* possible general methods for overcoming the problem. [2 marks]