

# 2008 Paper 11 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:

<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>
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]