

# 1999 Paper 10 Question 1

## Digital Electronics

An  $m : 1$  multiplexer has  $m$  data inputs,  $\log_2 m$  control signals and produces a data output which is equal to the input selected by the control signals. Each different combination of control signals selects a different input. Present an implementation, either as a circuit diagram or as equations, of an  $8 : 1$  multiplexer. [5 marks]

Show how  $8 : 1$  multiplexers can be cascaded to build a  $64 : 1$  multiplexer. [5 marks]

A  $2^m$ -bit decoder has  $m$  inputs and  $2^m$  outputs, with only one output taking the value 1 at a time. The particular output which has the value 1 at any given time is determined by the inputs. Each different combination of inputs selects a different output. Present an implementation of an 8-bit decoder. [5 marks]

How might a decoder be used as a functional component of a read-only memory? [5 marks]