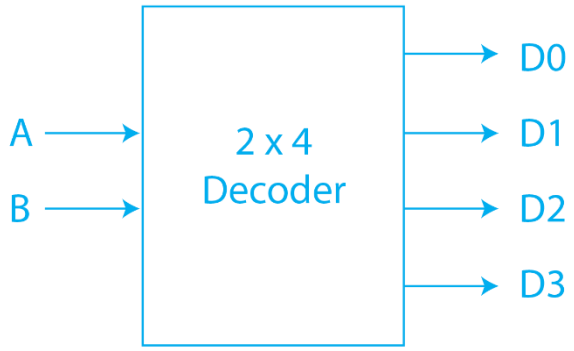
2x4 DECODER:

A 2 to 4 decoder is a combinational logic circuit that takes two input lines, typically labeled A and B, and generates four output lines, usually labeled Y0, Y1, Y2, and Y3. The decoder analyzes the input combination and activates the corresponding output line. Each output line represents a unique combination of the input lines.



The 2 to 4 decoder is called a "2 to 4" decoder because it has two input lines (A and B) and four output lines (Y0, Y1, Y2, and Y3). The number of output lines is determined by the number of input lines, following the formula: 2^n, where n is the number of input lines.

RTL CODE:

```
module decoder(input A,B, output [3:0]y);
  assign y= ~(A & B);
  assign y = ~A & B;
  assign y = A & ~B;
  assign y = A & B;
endmodule
```

TESTBENCH:

```
module testbech;
```

```
  reg A,B;
  wire [3:0]y;
  decoder d1 ( A,B, y);
  initial
    begin
      $dumpfile("dump.vcd");
      $dumpvars(1);
    end
  initial
    begin
      A=0 ; B=0;
      #10 A=0 ;B=1;
      #10 A=1 ;B=0;
      #10 A=1; B=1;
    end
  initial
    begin
      #60 $finish();
    end
endmodule
```