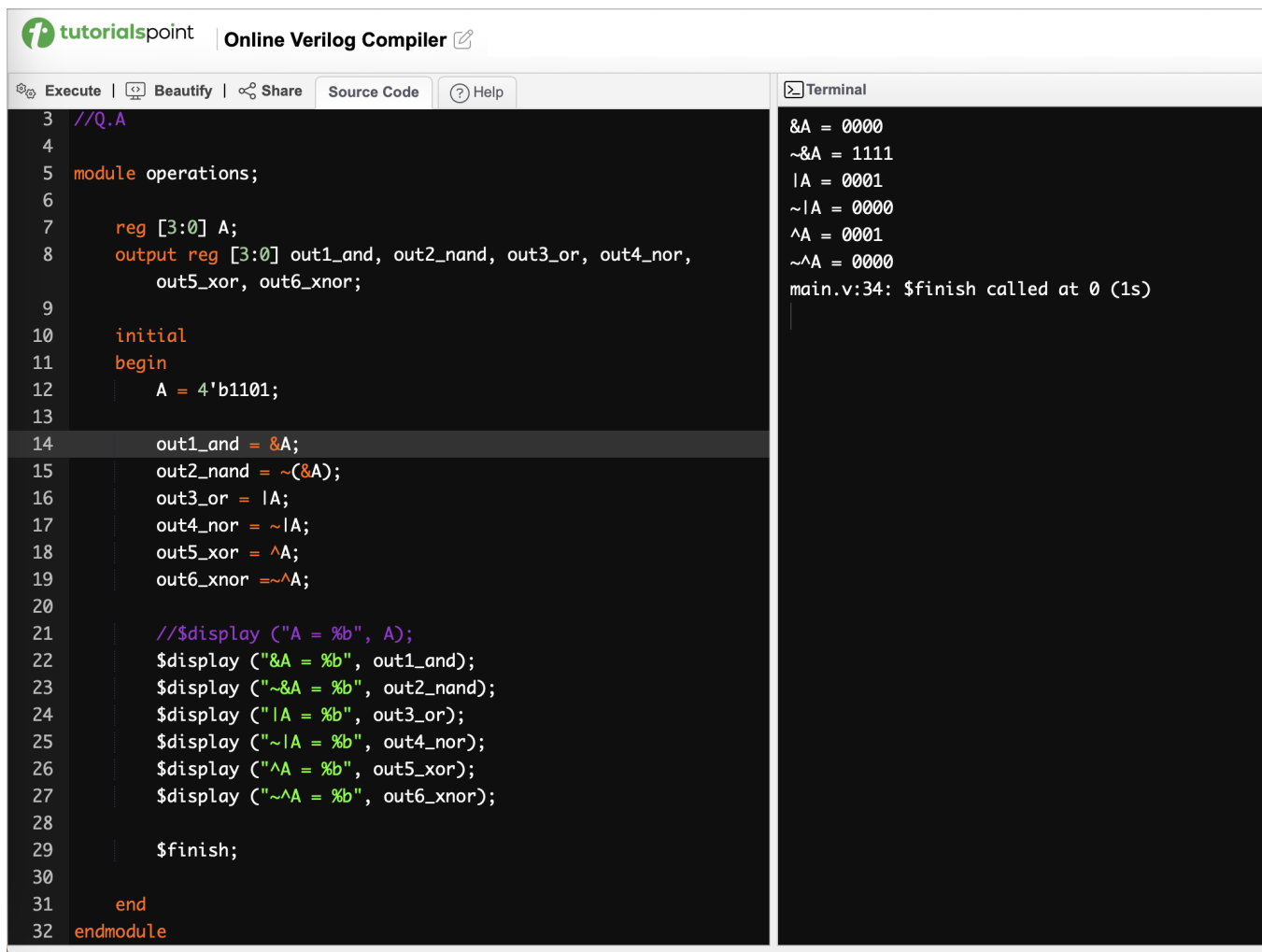


Q.A

1.



The screenshot shows the 'Online Verilog Compiler' interface. The left pane contains a Verilog code snippet for a module named 'operations'. The code defines a 4-bit register 'A' and six output signals: 'out1\_and', 'out2\_nand', 'out3\_or', 'out4\_nor', 'out5\_xor', and 'out6\_xnor'. It initializes 'A' to 4'b1101 and then calculates the outputs based on 'A'. The right pane shows the terminal output, which displays the binary values for each signal: &A = 0000, ~&A = 1111, |A = 0001, ~|A = 0000, ^A = 0001, and ~^A = 0000. The terminal also shows a message: 'main.v:34: \$finish called at 0 (1s)'.

```
3 //Q.A
4
5 module operations;
6
7     reg [3:0] A;
8     output reg [3:0] out1_and, out2_nand, out3_or, out4_nor,
9         out5_xor, out6_xnor;
10
11     initial
12     begin
13         A = 4'b1101;
14
15         out1_and = &A;
16         out2_nand = ~(&A);
17         out3_or = |A;
18         out4_nor = ~|A;
19         out5_xor = ^A;
20         out6_xnor = ~^A;
21
22         //$display ("A = %b", A);
23         $display ("%A = %b", out1_and);
24         $display ("~&A = %b", out2_nand);
25         $display ("|A = %b", out3_or);
26         $display ("~|A = %b", out4_nor);
27         $display ("^A = %b", out5_xor);
28         $display ("~^A = %b", out6_xnor);
29
30         $finish;
31     end
32 endmodule
```

Terminal Output:

```
&A = 0000
~&A = 1111
|A = 0001
~|A = 0000
^A = 0001
~^A = 0000
main.v:34: $finish called at 0 (1s)
```

2.

- a) 1'b0
- b) 1'bx

3.

- a) 1'bx
- b) 4'bxxxx
- c) 1'bx
- d) 12'b1010\_1010\_1x10
- e) 1'b1
- f) 1'b1

4.

a. 4'x11 is **illegal** as we can't represent an 8 bit constant in 4 bits. We require at least 5 bits to represent the above constant.

b. 'h3C is a legal declaration and will be represented in 32-bit binary as:

**0000\_0000\_0000\_0000\_0000\_0000\_0011\_1100**

c. 12'HABC is legal declaration and will be represented in 12-bit binary as:

**1010\_1011\_1100**

d. 4'b111011 is legal declaration and the 6-bit number can be represented in 4 bits as:

**1011**

e. 4'b11?? Is legal and will be represented as:

**4'b11zz**

f. 8'b1100\_1001 is legal and will be represented as:

**1100\_1001**