1. Given below is a 3 to 8 decoder with active low outputs, two 2-input nand gates, and one 2-input nor gate. Write the equation for the output F in terms of A, B, C. Take C to be the most significant input bit.

\[ F = \overline{C} \cdot (\overline{A} \cdot B + \overline{A} \cdot \overline{B}) = \overline{C} \cdot A \cdot \overline{B} + \overline{C} \cdot \overline{A} \cdot B \]

2. The following shows the logic for a full adder that adds two – 1-bit numbers. Write the Verilog code for the adder.

```
module FullAdder(A, B, Cin, S, Cout);
    input[3:0] A, B;
    input Cin;
    output [3:0] S;
    output Cout;
    assign {Cout S} = A + B + Cin;
endmodule
```

3. A 4-bit full adder can also be written using the "+" operator. Show how to implement a 4-bit full adder in Verilog using this operator.

```
module FullAdder(A, B, Cin, S, Cout);
    input[3:0] A, B;
    input Cin;
    output [3:0] S;
    output Cout;
    assign {Cout S} = A + B + Cin;
endmodule
```

4. What function does the following Verilog statement implement?
\[ f = \overline{(A \mid (B \& C))} + A \& B \& \overline{C}; \]
\[ f = (A+(BC)) + ABC = \overline{A(BC)} + ABC = \overline{AB} + \overline{AC} + ABC \]
5. Write the Verilog code to implement the following logical circuit.

6. Write the Verilog code to implement the following logical circuit.

7. Implement the following logical function using a 74138 3:8 decoder.
   \( f = \overline{ABC} + (A + \overline{C}) + \overline{ABC} \)

8.