Problem 1: In the following logic block, A, B, and S are input signals, and C is the output. Please write the truth table of the logic block (2 points) and describe its functionality (1 points).

Truth Table:

S	A	B	C
0	0	0	0
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	0
1	1	1	1

C = (A AND NOT S) OR (B AND S)
Functionality:
The logic block is a 2-to-1 Multiplexer (MUX)

Problem 2: Consider a logic function with three inputs, A, B, and C, and three outputs, D, E, and F. The function is defined as follows: D is true if at least one input is true, E is true if exactly two inputs are false, and F is true only if all three inputs are false.

a) complete the following truth table for this function

A	B	C	D	E	F
0	0	0	0	0	1
0	0	1	1	1	0
0	1	0	1	1	0
0	1	1	1	0	0
1	0	0	1	1	0
1	0	1	1	0	0
1	1	0	1	0	0
1	1	1	1	0	0

E = (NOT A AND NOT B AND C) OR (NOT A AND B AND NOT C) OR (A AND NOT B AND NOT C)

F = NOT A AND NOT B AND NOT C

Problem 3:

1) Which of the following statements is correct for a load instruction? Explain why.

A is the correct statement. MemtoReg selects the memory output that will be written to the register.

2) Whether each of the following statements is correct for an add instruction? Explain why.

B is the correct statement. Add comes from $rs and $rt. It selects the second ALU input from the register not a value.

Problem 4: In the following processor design, when executing the instruction beq $s1, $t1, offset, please

1) what would be the output of the logic block highlighted in red?
   1
2) what would be the next PC value?
   80056
3) what type of addressing method is used?
   PC Addressing